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ABSTRACT

The report documents first year activities of the Educational Center for Disabled Students serving college students with a broad range of both physical and learning disabilities at the University of Nebraska-Lincoln. Center goals include improving student academic performance and attitudes through the use of computer technology and academic skills training, establishing the Center utilizing appropriate computer equipment and software, and disseminating model project information. First year activities focused on development of the Center, obtaining technological and supplemental equipment and materials, and determining how these materials could best be utilized. Other first year activities included developing an evaluation plan to guide formative activities, identifying the population to be served, identifying additional academic skill training to supplement use of the technological equipment, and initiating project dissemination activities. Preliminary conclusions are that technology is primarily applicable to the solution of problems involving sensory input or motor skills; that use of technology must be paired with assessment of knowledge and performance skills; that disabled students require few specialized adaptive devices or programs to use the computer; and that technology should be used to alleviate sensory and motor skill problems throughout the educational system. Appendixes include planning documents, assessment instruments, suggested intervention strategies, a bibliography of information sources, and an equipment and software inventory. (DB)

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DEMONSTRATION PROJECT

1985 - 1986 FINAL REPORT

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I. OVERVIEW

The Educational Center for Disabled Students was established in August, 1985 to provide services to students with a broad range of both physical and learning disabilities. The Center has three primary goals:

1. Improve student academic performance and attitudes toward success in college through the use of computer technology and academic skills training.

2. Establish the Educational Center for Disabled Students utilizing appropriate computer equipment and software.

3. Disseminate model project information concerning computer technology and academic training to prospective students, parents, the business community and other postsecondary institutions.

First year activities have centered around the establishment and organization of the Center. Major activities for the first year have involved:

1. Developing an evaluation plan to guide formative activities and specify outcome instruments and measures.

2. Identifying the population to be served and developing appropriate assessment instruments and methods.

3. Identifying available computer, adaptive equipment and software and establishing the physical aspects of the Center.

4. Identifying additional academic skill training that should be provided to supplement and enhance the usability of the technological equipment.

5. Initiating project dissemination activities and submitting presentation proposals for second year dissemination.

These activities are organized around the specific program goals and objectives specified in the Formative Evaluation Plan (Appendix A). The Evaluation Plan Progress Report (Appendix B) summarizes first year progress and activities for each program objective.

This report will detail first year activities in the five areas specified above. Activities reported will be cross referenced with program objectives specified in the Evaluation Plan for easy reference.

II. ACTIVITIES SUMMARY REPORT

A. Evaluation Plan Development

As reported in the Six-Month Progress Report the Center Evaluation Plan was completed during the fall of 1985. The Plan specifies both a formative and summative section. The formative plan (Appendix A) details staff activities for each main goal and objectives related to the goal. An evaluation objective specifying how the objective will be completed and documented was developed for each objective. A timeline was created for the second year (1986-1987) indicating when activities related to each objective in the evaluation plan will be completed (Appendix C).

Formative evaluation activities involve monitoring progress for each objective in relation to the scheduled time line. First year progress is summarized in the Evaluation Plan Progress Report (Appendix B). This report provides a status summary of progress in relation to the time line for the activity. It also provides a short summary or comment on the progress made for each objective.

The Evaluation Plan was designed to tie together activities in all three goal areas and to tie Center activities to the summative outcome evaluation. Under Goal 1. Improve Student Academic Performance and Attitudes, three main Center needs were identified:

1. There was a need for assessment of participant skills and needs, both in the use of the computer and other technological equipment and in supplimentary academic and study skills areas.

2. There was a need to provide participants with training for using Center equipment and with supplemental training in academic skills.

3. There was a need to document and evaluate the effectiveness of Center training activities and the use of Center equipment in improving participant performance and academic progress.

These needs were combined into the formative evaluation plan for Goal 1.

The formative plan specifies seven objectives indicating Center activities designed to meet these needs. Objective 1.1 specifies that the Center will evaluate the equipment and skill training needs for each student in the program. Objectives 1.2 and 1.3 indicate that training in the use of equipment and in academic skills will be provided based on the needs of the student. These objectives specify that the main activities of the Center in meeting Goal 1 will involve

assessment of student needs and providing training to students. The procedures specified insure that the needs of each student are adequately assessed and that Center training is provided in relevant need areas. Details of first year progress in these areas are provided in Section 2-B.

Objectives 1.4, 1.5, 1.6, and 1.7 specify evaluation activities designed to assess the effectiveness of Center activities. Objective 1.4 specifies that ongoing evaluation of training will be done by assessing student progress in the use of equipment and in skill training materials. The remaining three objectives concern summative evaluation activities that are specified in the Summative Evaluation Plan (Appendix D).

Objective 1.5 is concerned with evaluation of student academic progress. Included in this evaluation are measures of drop-out rate, percentage of disabled student admissions, grade point average and semester credit hour load. It was determined that the Center should impact on each of these areas by increasing the percentage of disabled students enrolling at the University, increasing the overall GPA of disabled students, increasing the number of credit hours taken each semester, and reducing drop-out rates. Details of measures and experimental design are provided in the Summary Evaluation Plan (Appendix D).

Objective 1.6 is concerned with evaluation of the impact of the availability of computers and adaptive equipment on student writing. It is believed that students' writing should improve if they are provided with technological equipment that makes writing possible. Assessment of writing was done for each student through a writing sample at the start of the spring semester (January, 1986). This sample asked students to respond to one of two questions: 1) What are the qualities of a good teacher; and 2) What is the purpose of a college education. A second sample will be obtained at the end of the first semester (December, 1986). Both the samples will be scored by independent raters and a pre-post comparison will be done to determine if writing has improved over the year. The same samples will be obtained from a control group of disabled students who are not currently using the Center for statistical comparison. A test of the relation between use of the Center and writing improvement will also be done using the final writing sample and the Center use logs (Appendix H). Details of measures and design are provided in the Summary Evaluation Plan (Appendix D).

Objective 1.7 is concerned with changes in students' attitudes and perceptions about school and their abilities resulting from use of the Center. It is hoped that the improvement in the ability to do school related work resulting from having the Center's equipment and skill

training will result in an improvement in overall attitudes toward school and improvement in self-perceptions of ability by students. The instrument for assessing these attitudes is the Intake/Attitude Survey (Appendix F). This instrument is administered at the start of the fall semester (September) each year and to all new students when they begin using the Center. Administration and scoring is supervised by Dr. John Berman, Department of Psychology, University of Nebraska-Lincoln. Comparisons are made between the initial survey at intake and subsequent annual fall semester surveys. Relations between use of the Center and attitude change are also assessed by relating time in Center activities from Center use logs, and attitudes from the annual survey. Details of the design are provided in the Summary Evaluation Plan (Appendix D).

The summative activities insure that a broad range of relevant student performance measures will be assessed and that the effectiveness of Center activities is adequately determined. All summative evaluation activities are scheduled for initial analysis during the second year. Details on the time line for these activities are provided in Section III and Appendix C.

Under Goal 2, Establish the Educational Center for Disabled Students, four needs were identified:

1. There was a need to establish the physical aspects of the Center, including assessing the needs of the disabled population to be served, assessing available technological equipment and software, and obtaining needed equipment and software.

2. There was a need to identify additional services available at the University that could be utilized to meet student educational needs.

3. There was a need to develop and implement an evaluation plan to document and assess Center activities.

4. There was a need to examine other funding sources and begin procurement of additional funds to expand the Center's equipment.

These needs were combined into the formative evaluation plan for Goal 2.

The Formative Evaluation Plan specifies eleven objectives for meeting these needs. The first six objectives relate to the need to establish the physical center. Objectives 2.11 and 2.12 specify that the Center staff will conduct a general assessment of the population served to determine the general equipment and educational needs of disabled students using

the Center. These objectives are completed by summarizing the individual student assessments done under Objective 1.1 to develop a population profile. This activity is done each semester to identify needs for the current student population.

Objectives 2.21 and 2.23 specify that Center staff will assess the available equipment and software on an annual basis for meeting the needs identified in Objectives 2.11 and 2.12. Objectives 2.31 and 2.32 specify that identified equipment and software will be obtained during each semester following the needs and availability assessments.

Objectives 2.41 and 2.42 relate to the need to identify additional services available at the University. Objective 2.41 specifies that the Center staff will conduct an annual review of University services to determine what is available to meet student needs. This process is done to avoid duplication of already existing services that could meet educational needs of the student population in the Center. Objective 2.42 specifies that cooperative agreements will be arranged each year between the Center and identified University service organizations.

Objectives 2.51 and 2.52 specify that the Center staff will develop an evaluation plan and implement that plan. The plan will be reviewed and updated annually.

Objective 2.6 relates to the need for additional funding and specifies that Center staff will examine additional funding sources and submit funding proposals. These activities are the basis for expansion and continuation of Center activities beyond federal funding.

The objectives insure that development of the Center proceeds in an organized fashion with equipment and software obtained to meet identified need areas. The objectives also insure that duplication with existing services is avoided and that suitable evaluation and tracking of Center activities is done. There are no summative evaluation objectives under Goal 2. Determination of success and adherence to the Evaluation Plan is made by assessing the completion of activities against the time lines established for the conducting of assessments and obtaining of equipment. Details of first year progress in these areas are provided in Section 2-C and 2-D. Second year time lines for these activities are provided in Appendix C and are detailed in Section III.

Under Goal 3, Disseminate Model Project Information, four needs were identified:

1. There was a need to disseminate general information about the Center to area schools, parents, and

prospective students.

2. There was a need to disseminate specific information on program activities and evaluation findings to professional groups.

3. There was a need to assist transition to the workplace by providing information about identified adaptive equipment to the business community.

4. There was a need to provide students training for work with disabled populations with an opportunity to gain knowledge and experience in use of the equipment and training used in the Center.

5. There was a need to examine prototype equipment not yet available in the general market for usability and to provide manufacturers with information on the needs of disabled populations.

These needs were combined into the formative evaluation plan for Goal 3.

The Formative Evaluation Plan specifies seven objectives for meeting these needs. Objectives 3.1 and 3.4 meet the need for disseminating information to schools, parents and students. Objective 3.1 specifies that the Center will publish a quarterly newsletter to be distributed to state and area schools informing them of Center services and activities. Objective 3.4 directs the Center staff to provide information to parents and students through mass media, presentations to parent and student groups, and informal contact with prospective students and their parents.

Objective 3.3 meets the need to distribute information on program activities, methods and findings to professional in the fields of education, special services and rehabilitation. This objective specifies that the Center staff will submit proposals for professional conferences and papers for publication in professional journals about identified interventions and evaluation findings. These activities will disseminate information to a broad range of professionals in the field.

Objective 3.5 specifies that the Center staff will provide information to prospective employers and the business community on uses of technology for the disabled in the workplace. This information will be disseminated through published materials and presentations to business organizations.

Objective 3.6 specifies that the Center will provide internship opportunities for interested University students to allow them to gain hands-on experience in Center

activities.

Objective 3.7 is related to the need to examine new prototype equipment and directs Center staff to pursue opportunities to test and evaluate new equipment and software.

Objective 3.2 is a general objective related to the development of dissemination materials. It specifies that Center staff will develop and update dissemination materials in all areas on a semi-annual basis. This is done to keep information current on equipment and training materials.

These objectives insure that dissemination reaches all relevant parties and is updated to be current. There is no summative evaluation of these objectives. Determination of success for dissemination objectives is measured by adherence to the scheduled time lines for updating materials and by actually presenting at workshops and meetings. Success in providing internship opportunities is determined by the number of interns actually serving in the Center. Details of first year progress in these areas is provided in Section 2-E. Second year time lines are provided in Appendix C and are detailed in Section III.

Summary

The Center evaluation plan provides a coherent direction for Center activities and documentation and evaluation measures to determine adherence to the plan and success of Center activities. It is geared to the needs of the Center in the three goal areas identified: 1) improving student performance; 2) establishing the Center; and 3) dissemination of model project information. The activities of establishing the Center are tied to the assessed needs of the student population being served. Summative evaluation activities are designed to assess the utility of the Center in terms of improvement in a broad range of academic performance areas and student attitudes. Dissemination activities are tied to presenting information gained from the operation of the Center to relevant interested parties. The plan specifies specific staff activities with time lines to allow for continual monitoring of progress and timely completion of summary reports.

The completion of the Evaluation Plan is seen as a major first year accomplishment. The completeness of the plan should allow for complete documentation of Center activities and provide a solid direction to Center staff. This will allow easy replication of the project in other areas.

B. Client Population and Assessment

A major task in the establishment of the Center was the determination of the population to be served and how the needs of this population could be assessed and met by the Center. These activities relate to Objective 1.1, assessment of individual student equipment and skill training needs, and Objectives 2.11 and 2.12 determination of population, equipment and educational needs. At the initial establishment of the Center, it was understood that the Center would serve students with a broad range of both physical and learning disabilities. This allowed a tentative determination of what need areas were likely to be and what equipment and skill training would be required. It was apparent, however, that a more precise knowledge of student needs and a more complete profile of the population was required if the Center was to maximally serve the students using it.

Assessment Activities and Instruments

As a branch of Handicapped Services at the University of Nebraska, the Center was open to any student who qualified for services. An independent assessment for disability classification or eligibility was therefore not needed as students already had clinical disability assessments on file with the Handicapped Services office. It also became clear that the clinical assessment was not necessarily useful in determining student needs for equipment or specific skills training.

What was needed was an assessment of two areas: 1) how well the student was able to access and use the computers provided by the Center; and 2) what additional educational needs existed that could not be addressed by the computers. These assessment concerns led to the development of an assessment model referred to as IPO (Input - Processing -Output). This model is used to examine the impact of the student's disability on educational tasks, such as reading, writing, notetaking and remembering data, in terms of a cognitive information processing view. Within the model, input functions refer to processes that the student uses to acquire information primarily reading and listening. Processing functions refer to the student's ability to use data once it is obtained, primarily memory skills and cognitive processing ability. Output functions refer to processes that the student uses to present information, primarily writing and speaking. The student's disability is assessed as to whether it creates difficulties in one or more of these areas.

It was determined that the appropriate use of computers and other technological equipment was to alleviate input and/or output difficulties. For example, written material could be scanned into the computer and voiced for visually impaired

students or single switch access could be provided for the physically disabled person. Specifics on the range of adaptive devices identified are provided in Section II-C. With the goal of using the computer to alleviate input and output difficulties the content of student assessment was finalized.

To conduct assessment, an instrument was developed to summarize the information needed. The instrument is provided in Appendix E. The instrument is designed to be used in conjunction with an interview by Center staff. Data is obtained by self-report by the student and by demonstration. Staff records the findings by checking the appropriate pre-coded response (for usage and ability questions) or by filling in comments or data in open-ended sections (ie. maximum work time). Data gained from the interview is collaborated by reference to existing assessment data in the student's handicapped services file.

To assess input and output problems it was necessary to assess what educational areas the student had difficulties with. Areas that were identified as critical input-output functions for school work were reading, writing, and notetaking. Assessment of these areas involved determining the student's level of skill in each area and what disabilities impacted this area (ie. physical, visual, learning, hearing). Areas of self-reported low skill and/or areas where the disability significantly affected performance of the skill were targeted for intervention with computer or other technological equipment.

It was also necessary to assess the student's ability to access and utilize the computer once it was determined that a computer intervention would be beneficial. The first part of this assessment was geared toward determining the need for augmentative computer access. This assessment was oriented toward determining the extent of the student's capability to use the normal entry mode of keyboarding and use the normal output modes of screen and printed output.

A physical assessment examined mobility of hands and fingers to determine if the student could access a normal keyboard or required alternative access (ie. switch). An additional mobility assessment of arms, foot, head and eye blink was done to determine ability to use a variety of alternate access methods. This assessment allowed a determination of physical ability to access the computer and a targeting of what special adaptive equipment might be appropriate. A visual assessment examined visual ability range and any special visual problems along with any aids (ie. glasses) normally used. This allowed a determination of the ability to use an unaltered screen and a targeting of appropriate alternative output (ie. large print or voice). A final assessment of learning disability was done to determine if

any special perceptual or other learning disabilities existed which might interfere with understanding the keyboard or interpreting output. Included in both the physical and LD sections were assessments of fatigue and maximum work time to examine whether special access arrangements would have to be made (ie. operation while lying down, short work periods, etc.).

These assessments allowed a determination of individual needs and provided a general needs format to follow in purchasing equipment. A final assessment was made of computer background and typing ability to assess what type of training in computer use and typing would be needed before the student would be able to functionally use the computer. Assessments of hearing and speech disability were also done to determine the extent of impairment and the types of aids (ie. hearing aid, signing) used. This information could be used to determine if adaptive equipment could be used to alleviate input or output problems for hearing or speech impaired students.

Processing difficulties are not addressable by computer or equipment intervention alone. Generally, these difficulties are related to memory and use of information and are reflected by difficulties in remembering information from texts or classes, in understanding information that is remembered or in organizing information. In these situations obtaining (inputting) information or expressing (outputting) known information is not the problem. The difficulty exists in the ability to structure and use information that is obtained. The computer can do little to help these problems. For example, the computer can allow a person to write who could not physically write before; however, the computer can not tell the person the content to be written or help them organize their thoughts.

To address these difficulties skill training is required. The exact type of skill training needed for particular processing problems is as yet uncertain. Even the determination of what processing difficulties exist is far from clarified. Since these are problems that occur "in the head" it is much more difficult to assess the scope of the problem and determine an intervention than for the input - output difficulties. However, it was apparent during the first year that some interventions were needed in this area so an initial attempt at assessment and intervention was begun.

Assessment of processing difficulties uses one self-report question in the assessment interview. This question asks for a self-report on study skill ability and how the student's disability impacts studying. A person indicating study problems beyond the input-output problems of reading or writing is considered a candidate for having processing

difficulties. Also, LD students may exhibit difficulties in the processing area that are assessed through general questions about the extent and type of learning disability. While inexact these questions allow the staff to be aware of the potential for processing difficulties.

Information about processing difficulties is also obtained from the writing samples done by each student at entry to the program. These samples are evaluated diagnostically using the criteria outlined in Appendix G. This diagnostic provides an assessment of overall writing ability and particular areas of deficiency. If the writing indicates good content and organization but mechanical difficulties the problem is likely an output problem that can be addressed by computer interventions or a handbook on grammar rules. If the writing indicates content organizational problems a processing difficulty is also indicated suggesting the need for additional training in processing skills.

An additional source of processing information is obtained from the student's records. Past clinical diagnosis can provide information that can be used to assess the extent of processing difficulty, though this data is often unclear as to what specific problems exist and what specifically can be done to alleviate them.

It is not clear whether processing problems exist because of a specific disability or whether the problems exist because of lack of specific skills. In many cases the disabled have not received an adequate educational background in writing, problem solving, and general educational skills. The Center's assessment process is geared toward a skill deficit model that attempts to provide basic writing, text comprehension and study skills to students along with background knowledge training. This is an educational approach rather than a clinical approach. If processing problems that go beyond skill deficits are identified the Center will refer the student to more appropriate clinical services.

Once input-output and/or processing needs are identified, equipment and skill training interventions are provided. Center activities involve two methods for providing the needed assistance. For input-output needs, the Center provides the adaptive devices and the computers with relevant software (eg. word processing, spreadsheet). The Center staff provides training in the use of the computer, adaptive equipment, software and typing. These technological interventions are detailed in Section II-C. For processing needs, the Center provides training in text comprehension, study skills, notetaking and writing. Student needs beyond the scope of the Center are handled by referral to existing University services where available. These interventions are detailed in Section II-C.

Population Characteristics

Assessment activities provide the Center with demographics concerning the population served. The Disability Assessment Instrument described previously provides one source of information. From this instrument, the staff can obtain information as to the type of disability the student has and what technological and educational needs result from the disability. The student's records provide another source of information. Previous clinical or educational diagnoses provide information as to the types of disabilities affecting students. The final source of information about population characteristics is the Intake/Attitude Survey.

The Intake/Attitude Survey (Appendix F) is done on entry to the project and contains questions related to computer usage, school performance and disability related problems. The Center receives a summary report on the results of each survey done. This instrument provides information on past computer usage and attitudes toward computer use which are beneficial for structuring the types of computer training done. Educational information is obtained on courses in which students do well or poorly, amount of writing the students do, time spent in school related activities and areas where students have experienced disability related difficulties. This information is used to supplement the assessment interview and provide staff with an indication of where computer usage and training could be most beneficial. This survey is conducted annually so that updated information is obtained for each school year.

The information provided in these sources can be used to identify general population difficulties and need areas and can be used to guide the selection of equipment and training materials. By using the population characteristics, Center staff know what types of disability conditions will need to be served and what general educational needs are present. This information can be used to focus reviews of the literature on available equipment and training software and to select relevant conferences to be attended.

The population demographics of the student population using the Center are provided in Appendix J. This Appendix provides a breakdown of students by disability both for those students using the Center and the general student population registered in the Handicapped Services office. Also provided is a breakdown of student usage of Center facilities. This is divided by use of computer or technological equipment and use of other academic training or services. The population of students using the Center has increased from an initial twenty-five students in October, 1985 to a current population of forty-five students. Contact with prospective students has indicated that an additional eight to ten students will be enrolling in the University and using the Center in the

Fall.

A summary of identified student needs is provided in Appendix J. This summary details the population breakdown of technological and educational needs in the categories of input, processing, and output. In addition, adaptive needs related to computer access are summarized. The summary is the outcome of first year needs assessment activities under Evaluation Plan Objectives 2.11 and 2.12.

The population demographics indicate that the Center is serving a diverse population encompassing a broad range of disabilities. This means that the Center has had to examine technological equipment and training aids for a variety of disability types. It is anticipated that the Center will ultimately serve students across the entire spectrum of possible disability. The diversity of needs reflected in this population has moved the Center away from the utilization of highly specialized equipment and training methods to a more general purpose orientation. The Center has had utilize equipment and software that could be used to meet multiple needs.

The increase in students using the Center during the first year and the anticipated increase in students during the second year indicate that the Center is being perceived by students as a useful service facility. The Center staff are conscious of the need to monitor student usage and expand services as the student population increases.

C. Establishment of The Center

The primary purpose of the Center was to establish a comprehensive computer center to aid disabled students in completing college level educational tasks. While general purpose computer rooms have been available at many campuses, including the University of Nebraska, the Center's goal was to move beyond simply making a room full of equipment available. Primary issues to be addressed were:

1. What types of computer equipment and software were needed to allow students to accomplish a broad range of educational tasks?

2. What types of specialized equipment would be needed to allow disabled students served by the Center to access and use the computer?

3. What types of training would be required for students to learn how to use the computer, the specialized equipment, and the software?

4. What types of educational problems could the computer be used to alleviate and what are the limits of computer intervention in assisting the disabled student?

5. What computer knowledge and usage skills would be most beneficial for preparing students for employment following graduation?

It became apparent that these concerns were related. The type of computer used determined what software was available and therefore, what educational problems could be addressed. Also, the differences between computers determined what adaptive equipment was required and the extent of training needed to use the computer. To best address these issues Evaluation Plan objectives 2.11, 2.12, 2.21, 2.22, 2.31 and 2.32 were developed. These objectives specified that the Center staff would assess the equipment and educational needs of the students served (2.11 and 2.12), assess the computers, adaptive equipment and software available to meet these needs (2.21 and 2.22) and acquire the needed equipment and software (2.31 and 2.32). These objectives insured that the Center computers and equipment would be both usable by the disabled student population and functional in meeting their needs. Evaluation Plan objective 1.2, directing staff to provide training in the equipment and software for each student, insured that all students would be given the needed knowledge and skills to make use of the computers and equipment in the Center.

An additional consideration in all equipment selection and acquisition was the applicability of the equipment to the

broader, post-graduation work environment. The best transference of skills from the Center to the work place would occur if the students were provided with and trained to use common business equipment and software. To maximize transference to the work place, the Center staff attempted to utilize standard business equipment and software where possible and to use the least amount of specialized adaptive equipment. Through this approach students will be prepared to utilize equipment and programs they are likely to encounter in the work place and businesses will be able to set up a usable work station for the disabled with a minimum of adaptation beyond the standard equipment used by other employees.

Initial acquisition decisions were based on the expected population to be served. It was known that the Center would be serving a population that included physical disability, visual impairment, hearing impairment, speech impairment and learning disability. This allowed an initial determination of the general types of equipment that would be needed based on the experiences of professionals working in the field. As assessment of the actual student population progressed a more detailed understanding of equipment needs was possible.

The identification of student needs, assessment of available equipment and software, and acquisition of equipment and software has been an ongoing process during the first year. The result of these first year activities has been the establishment of a reasonably complete and comprehensive educational computer center, with a variety of computers, specialized adaptive equipment and software that can be used to meet the educational needs of disabled students and provide them with skills transferable to the work environment. The successful completion of the establishment of the Center is the primary accomplishment during the first year of the project. The Center is now equipped to serve the disabled student population and accomplish its other goals of improving educational performance and disseminating information on equipment uses and training.

The remainder of this section will detail first year acquisition activities and provide a summary of identified equipment and software that can be used to address the needs of disabled students.

Acquisition Activities

Initial acquisition activities involved a review of the available literature in the fields of adaptive technology and computer usage for the disabled. Excellent indexes of equipment and software for the disabled were available from Closing the Gap in Henderson, Minnesota and the Trace Center at the University of Wisconsin-Madison. These indexes provided a description of available equipment and software,

with reviews concerning usability and indication of what disabled populations the materials served. An initial indication of what was available and how it could be utilized was obtained from these sources.

While helpful, these sources were not adequate to provide a complete assessment of equipment and software. These resources focussed on highly specialized equipment. Since the Center needed to provide for a broad range of disability, it was not cost effective to purchase individual systems for each possible disability that would need to be served. This necessitated a further examination of equipment and software in an attempt to find materials that could be used by all or almost all of the students. The use of common equipment and programs would also make training and assistance by Center staff easier as expertise could be more readily developed by staff members.

As a supplement to available literature, staff attended the Closing the Gap conference in November, 1985 and the Discovery III conference in March, 1986. These conferences provided presentations on the latest developments in technology and vendor displays of computers, adaptive equipment and software. These conferences allowed the staff to become familiar with the latest developments and to do a "hands-on" assessment of equipment and software.

The review of literature and conference attendance provided staff with knowledge of what was available in the field. A bibliography of information sourses concerning technological equipment for use with disabled populations is provided in Appendix K.

At the same time, assessment activities were providing information on the problems that needed to be addressed with computer and technological equipment and software. The task of Center staff was to identify what available equipment could meet the identified needs in a cost effective manner. Preliminary assessment of available computers and software had determined that no single computer system could meet all needs. Based on availability and computer industry standards the IBM and Apple computers were selected as the basic equipment that would be utilized. These systems provided access to the vast majority of software that was available. Also, all of the available adaptive equipment for the disabled was available on one or both of these systems. There were, however, distinct differences between these systems that affected purchase decisions.

Much of the adaptive technology and educational software was available only on the Apple computer. This resulted primarily from the heavy use of Apple equipment in the educational system. Since much of the technology had been developed in a special education setting the technology was

Apple based. However, two problems with the Apple computer system were identified that affected the Center's use of these systems. First, the Apple systems were more difficult to operate than the IBM systems. The Apple keyboard did not allow for single key commands, therefore, all Apple programs required multiple key access. This made access by physically disabled persons quite difficult as many of them could not simultaneously strike two or three keys. Apple programs were also difficult to operate as most of them required the memorization of complex commands. Students working on the Apple systems were having difficulty mastering the programs and using the keyboard leading to high frustration levels and considerable errors in entering data and operating programs. Second, while the Apple system is extensively used in educational settings, the business environment is heavily oriented toward IBM systems. If student knowledge and skill was to transfer to the work place it would be more beneficial for them to learn the IBM system and IBM based programs.

The IBM systems had a number of advantages over the Apple. The IBM systems could be accessed by single keystroke commands. This eliminated the need for manipulating multiple keys and made access by the physically disabled possible without special keyboard adaptation. Most programs were easier to learn and operate making training easier and faster. Students were able to use the system more quickly and made fewer errors leading to a more positive attitude and higher usage of the computer. Additionally, students could be trained on standard business software which meant that they were learning the same programs used in the work place. The IBM systems had a disadvantage, however, in that much of the educational software and adaptive equipment was not available for the IBM.

The Center staff decided that the best course was to make both the IBM and Apple systems available to students. It was determined that the IBM systems would be the primary system that students would use for producing class related output, such as writing and numeric calculation. This was done because of the easier accessibility and better production program availability on the IBM. The Apple systems would be used for providing access to educational training software that was unavailable on the IBM. Word processing and spreadsheet programs were also made available on the Apple for students who already were trained on these systems.

To set up the Center, three Apple IIe systems were purchased. These systems included the computer, monitor, and disk drives. Initial plans were made to acquire two IBM desk top computer systems. Due to the higher cost of these machines, it was believed that a large number of IBM computers could not be obtained with available funds. A price drop on IBM equipment and special pricing available through the University caused a change in these plans, however. The

Center was able to acquire five IBM portable computers, two IBM PCs and an IBM XT computer. The portable computers contained the same memory, disk drives and screen that were available on the desk tops and provided an unanticipated benefit by being movable. Students were able to check out these computers to use during times when the Center facilities were not available. An additional grant from the University of Nebraska Foundation helped support the purchase of the portables and allowed the subsequent purchase of one hard disk drive IBM compatible, and the Large Print Processor.

The final Center set-up consists of five IBM portables, two IBM PC desk top computers, one IBM XT computer, the Words+ system, three Apple IIe systems, and an NCR word processing system that was acquired to provide easy word processing capabilities. Four Panasonic dot matrix printers, two Imagewriter dot matrix printers, two Epson dot matrix printer, one IBM graphics printer and one NEC letter quality printer are also provided for student use. The complete inventory of Center equipment is provided in Appendix (L).

Assessment activities identified a significant student need for software that could allow them to complete course work. The primary need was for word processing capabilities to allow students to more rapidly complete written assignments. Additional needs were for mathematical work and data storage. With the goal of providing training in software that would be applicable to the work environment the Center staff decided to use standard commercially available programs to fill these needs. Primary requirements were that the programs be easy to use, easy to learn, accessible by adaptive equipment, and capable of doing the required functions.

The PFS series of programs were decided on. This series provides a word processing program, spell checking software, a speadsheet for mathematical calculations, a data file program and a graphing program. The series could thus meet most anticipated needs for school related output. The programs are all easy to operate and learn. A consistent command structure is used so that operation is consistent across all programs. The programs are inexpensive and could be easily obtained by students for personal use. The series is also used extensively in business. An additional benefit was that the programs could be obtained for both the Apple and IBM computers so that the series could be used on any of the Center's systems. Word Perfect was purchased for the IBM for students who had mastered the PFS series and needed a more sophisticated program. The Appleworks program was also obtained for the Apple systems since it is a widely used word processing, data file program for these computers. An inventory of basic software is provided in Appendix L.

Once the basic computer systems and software were determined,

attention could be focused on obtaining adaptive equipment that would assist disabled students in using the computers and programs. Assessment of adaptive equipment focussed on identifying general purpose equipment that was applicable to a broad range of disabilities and that could be integrated with the basic computers and software being used. Cost considerations were also weighed in making final decisions. It was desired that adaptive equipment be obtained that could reasonably be purchased by single students for personal use and that could be easily obtained by businesses to adapt work stations for the disabled. These considerations moved the staff away from the purchase of expensive, special purpose equipment. Though a number of specialized work stations, devices and programs exist, these were deemed to be too expensive for private student use or impractical for easy implementation at the job site.

Assessment materials had provided a general scope of disabilities that needed to be served. The Center needed equipment for physical disability, visual impairment, hearing impairment, speech impairment and learning disability. Acquisition focused on two types of equipment: 1) accessing equipment for disability conditions that could not directly use the standard keyboard entry and screen output; and 2) equipment that could allow the computer to be used to alleviate or compensate for a disability limitation.

Accessing was considered a problem for the physically disabled and the visually impaired. Physical disabilities limit the ability to type and operate keys on the keyboard. Even when keyboard access is possible, physical disability may severely restrict the speed at which access can be accomplished limiting the usability of the computer as a writing tool. The review of literature and conference attendance indicated that a wealth of alternative keyboard accessing methods were available for the Center to consider. Limitations on these methods were quickly apparent, however, once testing was initiated.

Limitations stemmed from the fact that most of the alternative entry methods had been developed either in an early childhood special education context or in the field of augmentative communication. These methods were designed to allow non-keyboard access for the purposes of using educational training programs or using the computer as an alternative speech/communication device. The primary methods available were preprogrammed entry boards which are used to enter a set of predetermined phrases, words or commands and scanning which involves utilizing an alphabetical or other array that is controlled by some type of switching device. These methods were not designed to allow high volume or high speed entry since the tasks they were designed to do did not require a high volume of data. For the college population being served by the Center a critical need was for the

ability to use the computer to complete written assignments, such as term papers or reports. These tasks require a large amount of data entry. The basic alternative access methods available, while effective in allowing access, could not adequately handle the volume of data entry required.

Center staff responded to these limitations in two ways. First, a presentation at the Closing the Gap conference by Jack Heller indicated that direct keyboarding could be managed by physically disabled students even if they could only operate a singe stick or head stick. He had developed a program to teach touch typing skills to a broad range of disability conditions. Documented success of his students indicated that effective use of the computer could be made, at acceptable rates of speed, by most physically disabled students without alternative accessing methods. The Center obtained instructional materials for the Heller program from McGraw-Hill and focused on training physically disabled students to directly access the keyboard rather than using alternative input.

This method has been highly successful as all students served by the Center have been able to directly enter data from the keyboard without the need for alternative access. The Heller program has been combined with computerized typing instruction using the Typing Tutor program to train students in keyboarding using a touch typing method. For students with any ability to access the keyboard this method appears to be the best way to provide computer access at an acceptable rate of speed.

Center staff also continued to examine possible alternative input methods. It was recognized that while no students currently in the program required alternative input, there would ultimately be students who would be unable to directly use the keyboard in any manner. The Words+ system of alternative input was ultimately identified as a potentially practical alternative input method that could meet the needs of college students. The Words+ system uses a multi-dimensional scanning system based on words rather than the alphabet. The user is able to scan a 2400 word vocabulary that can be customized and enter a word at a time rather than having to spell each word. An additional benefit of the system is that is contains a word prediction feature that will anticipate the possible next word to be used based on the users past usage pattern. Acceptable input speeds of up to 20 words per minute are possible with this system.

An appealing feature of the Words+ system was its use of a basic IBM computer as the main system component. The Words+ scanning process operates from programed software rather than requiring equipment modifications. Switch access is obtained from an inexpensive plug-in input device that runs through a standard input/output port on the computer. The entire

system is easily updated by adding new software and would be easily usable on any IBM computer. This makes the system appealing for the work environment since businesses could create work stations for the disabled with no physical modifications to their existing equipment.

The Adaptive Firmware Card was acquired for the Apple IIe to provide single switch access. The Adaptive Firmware Card is constantly being updated and because of its ability to be used with any software there is hope that eventually it will allow faster access and become a feasible for the college population. It is now used to access educational programs.

The Words+ system and Adaptive Firmware Card provided the Center with alternative accessing methods and the Heller typing instruction program provided a way to provide access using the keyboard itself. These methods allowed the Center to address the range of potential need for alternative input methods for the physically disabled.

Visually impaired students presented a different accessing problem that needed to be addressed. While visually impaired students could access the standard keyboard and in many cases already knew how to type, they experienced difficulty with seeing the standard computer screen to obtain output from the computer. The review of the literature identified three methods of providing alternative output for the Visually impaired: 1) large print display; 2) voice output; and 3) printed braille output.

For visually impaired students who had some visual ability the large print display was appropriate. These devices enlarge the standard screen output on a different monitor. The display system chosen by the Center was the Visual Tech Large Print Monitor and Processor. This device provides a nineteen (19) inch diagonal screen with the capability of displaying up to 5 inch high letters and can be used with any commercially available software. The device provides for complete operator control of enlargement size and how the display is presented. Enlargement is available in a range from twice normal size up to sixteen times normal size (5 inch letters). The display can be presented on the entire screen or a single line can be isolated. Movement across the display can be done manually or the display can be set to scan the display line by line automatically. The speed of display scanning is user adjustable. This display system appeared to be the best available for providing large print display in terms of quality, variety of features and ease of operation. The system could also be attached to any computer system, either in place of the normal screen or in addition to the normal screen. One Visual Tech system was obtained by the Center.

Large print display can not alleviate access problems for the

totally blind. This necessitated examining the remaining options of voice output and braille print output. A variety of talking and braille output work stations were available. While high quality, in many cases, these specialized stations were expensive and used non-standard computers with specialized software. Since the Center needed to provide access to the IBM and Apple computers and software specialized work stations were not considered appropriate for Center use.

To obtain voice output on the regular systems being used the staff identified voice synthesizers that could be attached as peripherals to any standard computer. Of these voice synthesizers, the Votrax and DecTalk were identified as the best available. The Votrax provided a reasonable quality of speech with the ability to customize the unit to handle difficult or non-standard pronunciations at a low cost. Units could be obtained in the 300 - 400 dollar price range, making the Votrax reasonable for purchase by students for personal use. The DecTalk synthesizer was superior in quality to the Votrax; however, it was prohibitively expensive. The Center was able to obtain one DecTalk synthesizer through a grant from the manufacturer (Digital Equipment Corporation) that reduced the price from the normal $4000 to $1600. Since the voice quality is much higher on these synthesizers, the Center wanted one high quality machine for training and demonstration purposes. The better speech quality would make learning the computer and software easier for the student. Once they had become familiar with computer operation and voice output the Votrax synthesizers could be used for personal use. The Center currently has two Votrax synthesizers and one DecTalk.

Once the synthesizers were obtained there was a need for software that could output to these devices. Voice output requires a special program that can intercept output going to the screen and direct it to the synthesizer for speaking. Two types of speaking software exist: 1) dedicated speaking programs; and 2) general purpose speaking software which provides access to a variety of software. The majority of speaking software were single purpose dedicated speaking programs. These programs are single purpose programs that do word processing or spreadsheets but provide limited access to visually impaired students. To use these programs it was necessary to train the student in the operation of the speaking part and the functional part of each program used. This would significantly increase training time for students before they could productively use the program for class work. In addition, many of these programs did not contain high quality functional components that were as good as the standard word processors or spreadsheets being used by the Center for other students.

These problems with dedicated speaking programs caused the

Center to examine general purpose speaking software. A number of programs were available that could provide speech output from other programs. This software allowed the user to run standard programs, such as the PFS series, in the regular manner with the addition of voiced screen output. This appeared to be the preferred method of voice output since it would allow any program to be voiced and would be usable in the business environment where a variety of programs would need to be used.

The Screen Talk program from Computer Aids Corporation was chosen for the IBM systems because it could voice most standard IBM programs, including the PFS series used by the Center, and was reasonably priced. No general purpose speaking program could be found for the Apple systems so a dedicated speaking word processor was obtained, also from Computer Aids. This program; however, did not operate properly and was returned. The Center staff is now reviewing other programs for the Apple in hopes of finding a general purpose speaking program at a reasonable price. Thus, only the IBM systems are currently accessible through voice output.

Braille output is available through the use of a braille printer. These devices operate as a peripheral device much like a standard printer. Braille printers do, however, require special translation programs to create the braille print. Like the voice output programs, dedicated braille programs are available that combine braille print with a functional program, such as a word processor, or general braille translation programs are available that can translate the output from other software. The Center has not yet acquired braille output devices. All identified braille printers and translation programs were quite expensive (3000 to 5000 dollars), making them generally unobtainable by single individuals for personal use. In addition there were no students using the Center who could read braille. Since there was not an immediate need for this type of output, the staff felt that it was advisable to wait for future developments in the area that might reduce costs before purchasing any braille equipment or programs.

A number of problems were identified by the Center concerning equipment and programs for the visually impaired. First, while there is a wealth of equipment and software targeted toward this group, most of the dedicated equipment and programs for the visually impaired are considerably more expensive than standard equipment and software. The dedicated computer work stations are considerably more expensive than standard IBM or Apple systems. Dedicated word processors are more expensive than standard word processors such as PFS or Wordstar. In addition the Center experienced considerable difficulty making much of the equipment and software work. Technical documentation of how

to set up equipment was minimal and inaccurate where it existed. Many programs and equipment simply did not work as advertised and in some cases did not work at all. The Center staff feels that much of the equipment and software on the market for the visually impaired is of poor quality and in some cases constitutes a virtual "rip-off" of the visually impaired. Any materials to be obtained for the visually impaired must be closely examined and extensively tested to insure that the material does what it is supposed to. These difficulties seemed to affect materials targeted for the visually impaired much more than materials targeted for physical or other disabilities.

The identification and acquisition of accessing equipment for physical disabled and visually impaired students allowed the Center to provide computer access to all students using the Center. This completed the acquisition of adaptive equipment to supplement the basic computers and software used in the Center.

Additional equipment and software was obtained during the year as uses were identified. The first potential use of equipment identified was for notetaking. Many of the students using the Center were unable to take their own class notes and relied on notetakers to obtain notes. This process while beneficial, creates problems with consistency of obtaining notes and understanding notes taken by another person. The staff determined that it would be beneficial if computers could be used to allow disabled students to take their own notes.

Two types of equipment were identified that could meet this need. The first was portable silent typewriters. The Cannon corporation made a light weight silent typewriter that could be carried to class by the student. Since all students were either able to type or were being trained to type, they could use these typewriters to type their own notes. A second solution was to use the new lap-top portable computers. A number of companies make notebook size computers that can run word processing and other software. These could be transported to class and the notes could be transferred to the Center's regular computers or printed on the Center's printers. Some of the notebook computers are also able to run specialized software that allows entire phrases to be accessed by a single command. This could decrease the amount of writing needed to obtain complete notes.

The Center has begun testing the use of this equipment for notetaking. One Canon 5 Star typewriter and five TRS 80 lap top computers have been obtained. This equipment will be used to test the feasibility of class notetaking. This particular equipment was selected for its low cost ($200-300 per unit). Newer IBM compatible lap top computers are now on the market, though at a higher cost ($1300-2500). For

testing purposes the Center acquired one IBM Convertable lap-top computer. If the use of lap top computers proves to be successful, these higher priced but more powerful computers that can run standard software may be the best equipment to use. The Center was unsuccessful in obtaining a grant from IBM which would have supplied the Center with a number of IBM Convertible lap-top computers for research in this area. Continued efforts are being pursued to obtain resources for the acquision of more of these machines.

Another need identified was the ability to input preprinted data into the computer. Visually impaired students often needed to obtain written materials from periodicals or other sources that were not readily obtainable on audio cassette. The primary way of providing this service has been to have readers read this material to the student. Besides the problem of obtaining readers and the costs involved in paying them, the student did not have access to the material for review. Once the computers were equipped with the ability to voice output it seemed that the computers could be utilized to speak this material if a way could be found to enter the material into the computer. This would allow visually impaired students to be able to obtain material at any time and to have material available for review.

The staff identified a variety of optical scanning devices which could be utilized to read pre-printed input into the computer. The immediate problem with these devices was high cost. Most available scanners were over $10,000 making them prohibitively expensive. An additional problem was that most were designed to scan typewritten text rather than material printed in textbook or periodical form. Thus, many were incapable of reading double column text or the small print sizes in printed books and periodicals.

During the year the cost of these devices has decreased and as they become more common it is likely that costs will decrease further. The Center staff identified a low cost optical reader (the Omni Reader) that could be obtained to pilot the usability of these devices. Two of these devices were obtained. While the Omni Reader is relatively unsophisticated and requires manual movement of the scanner, it is able to read the material in books and periodicals and will allow the Center to determine the usability of these devices. If they prove usable more sophisticated equipment may be considered.

A final acquisition of the Center was a mouse input device for the IBM computers. This was obtained to allow a student access to a computer assisted design (CAD) program for engineering work. The mouse provides another potential alternative input method as it replaces the keyboard for commands and data entry. The mouse obtained can be used with the PFS software that the Center uses, so there may be

additional future application of this device. Further testing of this equipment will be done during the second year.

These acquisitions established the physical aspects of the Center. The complete inventory of adaptive equipment is provided in Appendix L. The establishment of the Center is an ongoing process that will continue throughout the second year and beyond. As new technology is developed there will be a need to acquire additional equipment or replace existing equipment. The same processes used in the initial establishment of the Center will be utilized to assess further equipment acquisitions.

Technological Interventions

The computers, software, and adaptive equipment obtained to date allow the Center staff to address a wide range of student needs. As previously indicated the computers, adaptive equipment and software are used to address input and output difficulties resulting from disability. Assessment examines where this equipment can best be utilized to assist the student. The process of fitting equipment to student needs constitutes the technological intervention strategy of the Center.

As indicated in the Section II-B assessment activities target specific technological interventions are based on the individual needs of the student. It is, however, possible to outline the general types of interventions utilized by the Center. These interventions are based on the general types of disabilities served and the technological equipment utilized in the Center. This section will summarize the way technology is used to impact on the student's disability. It should be remembered that within these general intervention methods there will be adaptations to meet the individual needs of the student.

The first group of student needs involve input difficulties. Input needs concern areas where disability limits the ability of the student to obtain school related information. Primary areas of difficulty are limitations on reading written material or hearing oral material since these are the main methods of obtaining information in the school setting. Input difficulties may result from visual, hearing, learning or physical disability and vary in severity from minimal limitations on input to complete inability to receive input in a certain form.

The input interventions used by the Center involve using the computer to compensate for sensory limitations. When the student's disability affects the ability to receive information in a particular sensory mode, the computer can be utilized to transfer the information to a different sensory

mode that the student can use. This capability allows student's to have access to information that they normally would be unable to obtain.

The first type of input disability is reading difficulty. This affects visually impaired students, learning disabled students, and in some cases physically disabled students. Visually impaired students may be unable to see print or read the small type styles used in text books. Learning disabled students may suffer from perceptual problems (Dyslexia) or other reading problems that make written material difficult or impossible to understand.

These disability limitations are addressed by use of the computer as an alternative input device. The primary equipment that can be used to provide alternative input is the optical scanner, large print monitor and voice output. Written material can be entered into the computer by the optical scanner. Once entered it can be enlarged on the large print monitor for visually impaired students who are unable to view small type. It can also be spoken using the voice synthesizers and speaking software. This allows the student to have the material presented in oral rather than written form.

While these same functions can be performed by copiers that can create enlarged copies and by taping (as from Recordings for the Blind), the computer offers advantages over both these methods. First, the computer can store large amounts of information eliminating the need for paper copies. When a large number of students need the same materials it is more cost effective to store information on disk than to make enlarged paper copies for each student. It is also possible for a student to obtain scanning equipment, the computer and a large print monitor or voice synthesis for personal use while few individuals could afford to own personal copy equipment.

The computer also allows access to information not commonly available from Recordings for the Blind or other taping sources. Information can also be obtained faster as there is need to send for the material from another source. In addition, the computer eliminates the need for dictation of books or other written materials onto audio tape.

The most significant advantage of the computer is in its editing and review abilities. Once data is entered into the computer it can be rapidly reviewed using the cursor and screen movement available. The student is able to move rapidly back and forth through the material and is able to control the speed of presentation. These functions make the computer more flexible than either audio tape or enlarged printed text.

The capabilities of the computer to provide alternative input can also be used to aid hearing impaired or physically disabled students. For hearing impaired students, lectures can be taped and transcribed into the computer allowing a visual reading of the material. Instructor lecture notes can also be optically scanned into the computer and made available. These methods allow the hearing impaired student to obtain oral information that would normally be unavailable. Some physically disabled persons are unable to obtain written material due to difficulty or inability to turn the pages. Again, this material can be optically scanned into the computer and accessed through the screen movement keys on the keyboard, eliminating the need to manually manipulate books or paper.

At present these functions must be performed in the Center on the Center's computers and equipment. The staff is examining the potential for using the new IBM compatible notebook computers to create portable work stations than could perform these functions. It may be possible to connect a small optical scanner to these portable computers and attach an internal speech board to create a small, lightweight system that could be carried by the student. This would allow the student to obtain written material at the source by taking the system into the library or home. It would also provide a powerful tool for the work place as written information could be quickly obtained and processed. The Center will continue to assess new developments during the next year in hopes of creating a reasonably priced system of this type.

The second group of student needs involve output difficulties. Output needs are areas where disability limits the ability of the student to express school related information. Primary areas of difficulty are limitations on writing material or speaking material since these are the main methods of expressing information in an academic setting. Output difficulties may result from visual, hearing, learning or physical disability and vary in severity from minimal limitations on output to complete inability to produce output in a certain form.

The output interventions used by the Center involve using the computer to compensate for limitations on the ability to produce written or spoken output. When the student's disability affects the ability to express information in a particular form, the computer can be utilized to provide an alternative method of expression. This capability allows student's to produce output that they normally would be unable to produce.

The primary output disability addressed by the Center is writing. Physically disabled students are often unable to manipulate writing tools, such as pencils and paper, to produce written output. Visually impaired students may be

unable to produce readable output due to an inability to see materials and format written script on paper. Learning disabled students, while usually able to physically produce written output, often have difficulty producing readable text due to letter transformations, organization, and spelling problems. Hearing Impaired students have difficulties with verb tenses and the nuances of writing. Since written output is required as an integral part of college instruction, any limitation on the ability to produce written materials will significantly affect college performance.

These limitations are addressed by using the computer as a writing tool. The computer can overcome physical limitations on the manipulation of writing utensils by providing a means for physically disabled or visually impaired students to enter data that can then be printed to produce written text. As previously described, a variety of accessing methods can be used to allow physically or visually disabled students to enter data into the computer. Word processing software can then allow students to format the text and produce printed output in the required format. The ability of the computer to process large amounts of data and format printed output in a variety of forms allows students to accomplish a high volume of writing that would be difficult or impossible to do by other means.

For learning disabled students, the computer can provide the ability to create readable written output. Word processing software allows editing of material prior to the final printed output so that letter transformation and spelling errors can be corrected. With hand written or typed material this editing process is more laborious and may require the rewriting of extensive sections of text. In addition proofing and spelling software is available that can detect the errors normally made by learning disabled students and alert them to where editing is necessary. The computer is thus able to allow learning disabled students to produce clearly expressed, readable written text.

An additional use of the computer as a compensatory writing tool is for student notetaking. Many disabled students are unable to take notes during class due to the inability to physically write. As indicated earlier there are significant benefits to being able to compose and record one's own notes as opposed to obtaining notes from a notetaker. Through the use of portable computers students can record their own written notes in the classroom using the same entry methods and word processing techniques they use on the computers in the Center. This allows disabled students to have access to an important part of the learning process that would otherwise be unavailable to them.

Another output problem results from speech disability. Students who have speech problems are often unable to

participate in class discussions or ask questions during class. This limits their access to information by restricting their interaction with other students or the instructor and limits their ability to clarify material they do not understand. This problem affects speech impaired students and students with other disabilities (ie. Cerebral Palsey) that affect the ability to speak clearly.

For these students, voice output from the computer can be utilized to replace normal speech. Phrases and questions can be entered by normal accessing methods or by preprogramming a set of phrases into the computer and the computer can then output these phrases through the voice synthesizer. This allows students to ask questions and participate in oral discussions.

The Center has not focused its efforts on directly supplying these augmentative communication devices to students. The Center has a cooperative agreement with the Augmentative Communication Center established by Dr. David Beukelman at the Barkley Memorial Center, University of Nebraska-Lincoln. The Augmentative Communication Center's mission is to test communication devices, provide training to personnel, and provide evaluations for disabled clients. This facility provides expert evaluations for Center students and in turn the Center provides internships and opportunities for observation to personnel training at the Augmentative Communication Center. This arrangement releases the Center from the need to obtain the range of equipment necessary to do evaluations in this area but still provides access to that equipment.

The technological interventions used by the Center are summarized in Appendix I. This Appendix presents the equipment and software used to meet input and output needs in table form, with specification of the disability it is used for, the computer it runs on, the function of the equipment or program, and comments. Center staff continually assess new developments in computers and software to identify additional interventions that can meet student needs.

D. Additional Academic Training Needs

As technological interventions were implemented in the Center, the staff identified additional academic training that would be required for students to effectively use the capabilities that the technological methods provided. The Center addressed academic training needs through the development of Evaluation Plan objectives 1.3, 2.12, 2.22, 2.32, 2.41 and 2.42. Objectives 2.12, 2.22 and 2.32 direct staff to assess the educational needs of the population, assess software available to meet these needs and obtain this software. Objectives 2.41 and 2.42 specify that the Center will review other services available to meet these needs and arrange for cooperative agreements with organizations providing these services. Also, Objective 1.3 specifies that the staff would provide training in these areas. These training needs fell into two categories: 1) compensatory skills training; and 2) training to intervene on actual cognitive disability. This section will detail first year activities related to these two areas.

Compensatory Skills Training

As noted in the Section C, disability has a significant impact on the educational process by limiting the ability of the student to receive needed information (input problems) and to express information to others (output problems). The technological interventions described can alleviate or compensate for these limitations by allowing the disabled student access to information from previously unaccessible sources or by providing the student with previously unavailable means of expression. The alleviation of these input or output limitations, however, revealed other academic skill problems.

Students who have had long term disability or who were disabled from birth have suffered input and output limitations throughout much or all of their school experience. This has resulted in their having little practical experience in performing the tasks affected by their disability. Since most of the input or output tasks such as reading, writing, or notetaking are skills that require practice for the development of competence, students with long term disability often have poor skills in these areas. Even after a technological intervention allows the student to perform these skills they may continue to have problems due to poor competence.

Students who have been unable to read printed materials often have poorly developed reading comprehension skills. Students often have well developed oral comprehension skills. There are, however, differences between the formal written language that is encountered in textbooks and periodicals and more informal oral language. These differences are often great

enough that even when text materials can be presented orally through voice synthesis the student may be unable to fully comprehend the material. These students simply lack experience in working with the language style used in formal writing. For them to make full use of the ability to receive printed information in verbal form they must receive reading comprehension training.

In similar fashion, students who have been unable to physically write often lack the technical and organizational skills required to produce quality written material. They have had little if any experience in using the conventions and style required in formal writing. In addition, they have little experience in organizing material for written presentation. Even after these students are supplied with word processing capabilities they may have difficulty composing and producing quality written text. For these students to fully utilize the writing capabilities available on the computer they must be provided with training in writing skills.

Notetaking abilities are also affected by lack of experience. Students who have been unable to take notes often do not know how to identify critical information in an oral presentation and record this information in a usable form. These students need to be provided with training in notetaking to utilize the ability to take notes provided by the portable computer.

A final area where disability has affected the attainment of educational skills is general subject knowledge. Due to input difficulties disabled students have often not received the full benefit of educational instruction. Even when they have been mainstreamed into the regular curriculum during primary and secondary schooling they often have been unable to receive all of the training and information available to non-disabled students. Students unable to read or to hear class presentations do not obtain the same depth of knowledge as non-disabled students. This problem affects students entering the post-secondary environment. In many cases, they lack the prerequisite background knowledge needed to succeed in college level courses. Once limitations on receiving information have been removed by a technological intervention, these students may need tutoring or other compensatory training to gain the needed background knowledge for college level work.

These difficulties are not a direct result of the disability itself. Rather, they result from limitations on the ability to receive information caused by the disability. Technological interventions cannot address these problems. The computer can alleviate an input problem by allowing the student to receive information in a different sensory modality or an output problem by providing a means to overcome a motor skill limitation. The computer, however,

can not substitute for lack of knowledge or skill.

The Center uses a skill training model to address these problems. This is an educational rather than clinical approach. These problems are viewed as resulting from a lack of educational training or experience rather than the disability or some other clinical pathology. Therefore, the Center's activities are directed toward providing needed knowledge or skills through educational methods.

The Center staff identified study and notetaking skills, writing skills, language comprehension and general subject area knowledge as the primary need areas. In addition, general computer usage and keyboarding skills training was required to allow students to use the available equipment. Progress in identification of training methods and implemented training activities in these areas will be detailed in the remainder of this section.

As staff explored potential training methods and curriculum requirments for these areas it became clear that studying, notetaking, writing and language comprehension involved similar skills and training needs. All of these activities had a large language component and required similar attention and organizational skills. Literature from cognitive and behavioral psychology was reviewed to identify skill requirements and training methods. The cognitive psychological literature indicated that the ability to selectively attend to important aspects of the material and the ability to organize material into meaningfully related cognitive structures in memory were critical for effective language based skills. The behavioral literature identified practice with the subject matter as the key element in the development of skilled performance.

Utilizing these findings from the literature the staff reviewed available educational programs for training study skills, writing and reading comprehension. None of these programs appeared to make full use of the research findings and methods developed in the psychological literature. Also, these programs did not focus on the similarities between the skills needed in all of the areas. To provide a better method of training the staff initiated development of a comprehensive cognitive skills training program that could be used as the basis for training study skills, notetaking, writing and language comprehension.

Development of the content of the cognitive skills training program is currently underway, with implementation scheduled for the 1986 fall semester. The general cognitive skills program has had to be integrated with specific study and writing skills curriculums to develop a complete training package. The development process has involved both developing new training materials and methods and selecting

materials from existing programs. In addition, an examination of computerized educational software is being conducted to see if the computer can be used as a teaching device and if programs have been developed that could meet some of the desired training needs. Since the cognitive skills program is a new approach to skill training in the areas identified, assessment of the usefulness of the program and continued development will occur during the second year.

The cognitive skills training program is based on a model of psychological processing developed from cognitive research involving levels of processing and schema theory. Research in these areas has indicated that the ability to comprehend information, store information in memory and utilize information to produce skilled behavior results from the way that information is processed and organized. To be fully understood and remembered, information must be transformed from its original form at input into a new form related to existing knowledge. This constitutes deep or semantic processing where processing is directed at extracting critical points or important aspects of the information rather than attempting to remember or process all of the information provided. To accomplish this processing, attention must be directed at identifying the most important aspects of the information and this information must be selected for further processing within the cognitive system.

Once selected and processed information must be stored in memory structures. Schema theory and research indicates that information storage is done in relation to the information already existing in memory. Full comprehension and long term memory for information is a function of how well the information can be placed within the existing memory content. To be adequately stored in memory information must be processed into a form that is consistent with existing knowledge and that provides links between new and existing information. The ability to use information to produce skilled behavioral output depends on the ability to access information structures in memory and how well accessed information is related to the task to be performed.

The cognitive skills training program trains students to recognize and extract critical information from written or oral materials by constructing information units called idea units. These idea units contain a single main subject which identify the most important information in the material and modifiers which expand and clarify the subject. Idea units are connected by horizontal relationships which identify such things as similarity or cause and effect, or by vertical relationships which structure the idea units into a hierarchy of dependent relationships. The creation of idea units specifies what the main information is and how it is related within the material.

Students are provided with a step-by-step method for using idea units to guide the reading of text or listening to oral material and the relating of the newly constructed idea units to their existing knowledge of the topic area. This process should help students to recognize important information and remember material better.

Notetaking and writing training also use idea units to guide the production of notes or written material. Students are instructed to use idea units as the content of their notes over class or text material. As idea units are identified and constructed the student records them in an outline format. The student's notes thus become a listing of idea units organized in hierarchical form. Since the idea units contain the most important information in the material, the student has usable notes that summarize the main points of the lecture or text. Since the idea units were constructed by the student to be meaningful for him or her, the notes should also be more understandable when referenced later. The student is also freed from trying to take down everything that was said verbatim.

For writing the student is instructed to begin organizing the paper by extracting idea units from memory about the topic. These idea units are then organized by the horizontal and vertical relationships between them to provide the student with an outline of the information to be written. This outline is then used to guide the production of the final product which is created by elaborating on the information in the idea unit outline.

The training course contains instructions on how to create and use idea units and a workbook with practice exercises designed to allow students to gain experience using the methods trained. The staff feel that this method of training language skills holds much promise for increasing the abilities of disabled students to gain information from their class and reading activities and to use this information to produce quality notes and written output.

The cognitive skills training program cannot meet all needs of students for compensatory training. Students may also need instruction in writing mechanics, such as punctuation and sentence construction; reading skills, such as decoding or word recognition; or specific subject matter content, such as mathematics, history or science. Staff reviewed educational computer software as a possible means of providing for these needs.

There was little available educational software for the college level population being served. Most skills training software was designed for the elementary school age group. This occurred because beginning reading and writing skills are generally taught during the elementary years. Since this

software was targeted to children, much of it was not appropriate for the older population being served by the Center. The level of language used, tasks performed and methods of presentation were often far below the level of functioning demonstrated by college students. Even in the area of content skills, such as science or math, the preponderance of available software was targeted to beginning elementary level students.

Because of the unavailability of appropriate educational software the Center has acquired only a limited number of programs for educational skills training. The Center has obtained a typing instruction program that is used to teach keyboarding skills. A program, Proteus, has also been obtained that can be used to teach writing skills and to organize information for written papers. The Proteus program uses similar concepts to those in the cognitive skills training program so that it can be integrated easily with the Center's cognitive training.

A general knowledge instruction series call Knowledge Master has been obtained to provide students with background information in particular content areas. Knowledge Master is a series of programs covering a broad range of content in English, science, math, humanities and social studies at the high school level. Students can use the program to obtain vocabulary and general information about the topics provided. The information is presented in a quiz format similar to that of a television game show in which the student can compete against another person or the program. The level of content and presentation format are high enough to be both interesting and useful to college level students.

These materials constitute the compensatory skills training interventions utilized by the Center. A summary of skill training/processing interventions is provided in Appendix I. The Center is not an educational program or tutoring organization so the skills training interventions utilized are geared toward providing educational training that is needed to allow students to utilize the technological equipment and software to their advantage. The Center staff work to identify other available services that can meet student educational needs and to arrange for Center students to obtain these services. It is felt that the best way to alleviate educational skill deficiencies is to provide technological intervention at the primary and secondary levels so that disabled students are able to fully participate in the educational process from the beginning. As this is accomplished there will be less need to help students gain skills they were unable to obtain due to their disability.

Training for Cognitive Disability

The second class of skill training needs are those that directly result from disability. The educational needs discussed previously resulted from input and output limitations that restricted access to information. Students with these difficulties do not necessarily suffer from any mental or cognitive problems they merely have poorly developed skills. Cognitive disabilities, however, directly affect the ability to use and process information. These disabilities result from conditions that affect the physical condition of the brain and nervous system or the ability to process information. Cognitive disabilities may result from accident, disease, birth defect, minimal brain dysfunction or more subtle learning disabilities. Regardless of the exact clinical pathology involved all of these disabilities impact on the educational process by restricting the ability of the person to learn information, remember information, or use information.

The Center is not equipped to directly address these types of disabilities. Intervention on organic symptoms or psychological difficulties resulting from these conditions require specialized treatment and services that are beyond the scope of Center activities. Center technological and skill training interventions can, however, be used to supplement other treatment. Where the cognitive disability has resulted in input or output restrictions the technological interventions can be used to help alleviate difficulties. Where educational skills are lacking the Center's cognitive skills training program and other educational training can be used. The extent to which these are successful will depend on the type and scope of the cognitive disability.

The Center currently serves students suffering from head trauma and learning disability. It is anticipated that other students with cognitive disabilities will utilize the Center in the future. Generally, these students are already being served by clinical treatment. The Center does, however, assess for cognitive dysfunction and observes students for indication of cognitive problems that go beyond skill deficiencies. When these are identified the Center will attempt to refer the student to more appropriate assessment and treatment facilities.

E. Project Dissemination Activities

As a demonstration project a primary mission of the Center is to provide information on identified interventions and evaluation findings to other interested parties. Project Goal 3 in the Evaluation Plan is directed toward dissemination activities. The program objectives under this goal specify that dissemination should be done to professionals in the field of disability services and education, the business community and prospective students and their parents. This section will detail first year dissemination activities in these areas.

Dissemination activities to prospective students and parents concern the need to make students aware of the Center and the services it provides. Students must be aware of the availability of the Center if they are to make use of the facilities. Awareness must extend beyond the current University population. Students, parents and educational personnel at the high school level must also be aware of Center services for educational counseling, planning and decision making. Evaluation Plan Objectives 3.1 and 3.4 specify activities for dissemination to this audience.

The primary vehicle for providing information on the Center at the high school and college levels is the Center newsletter. The newsletter is published quarterly and provides information on Center facilities and activities. This newsletter is distributed to all members of the Association on Handicapped Service Programs in Post-Secondary Education (AHSSPPE) nationally, to the handicapped service offices of all regional colleges and universities, to the directors of special education in all public school districts in the state of Nebraska and to all Nebraska state rehabilitation offices. Through this distribution information on the Center is provided to school systems, post-secondary institutions and disability service offices. The first newsletter was published in March, 1986. The second newsletter was published in June, 1986. Copies of both newletters are provided in Appendix M. The September, 1986 newsletter is currently in press.

Additional dissemination of information concerning the Center has been obtained through articles in the local press. Articles about the Center have appeared in the Lincoln city newspapers, the University student newspaper, and the University staff newsletter. These articles have provided information on the Center to a broad sector of the general area population and to the students and staff at the University.

Additional information has been provided to parents and prospective students through phone conversations and personal tours of the Center. The Center has been contacted by a

number of high school students and their parents about the availability of services. These contacts have resulted in an increased interest by these students in enrolling at the University.

These dissemination activities will continue during the second year. The Center staff will also examine the possibility of presenting to area high schools and parent organizations to provide further knowledge of Center activities.

The second area of dissemination is to professionals in the educational and disability services fields. While these groups need general information about the Center, the primary dissemination needs in this area are for data that can be used to replicate Center services in other locations and for data on the types of interventions used and their effectiveness. Objective 3.3 in the Evaluation Plan specifies the providing of this information.

While the newsletter is distributed to professionals and provides them with ongoing information on Center activities, the primary methods of providing information to these groups are presentations at professional conferences and publication in professional journals. These activities provide professionals with specific technical information on replicating Center interventions and the effectiveness of Center activities. Since first year activities were focused on identification of needs and the establishment of the Center, dissemination in this area was minimal. A considerable amount of dissemination is planned for the second year.

First year presentations were done at the following conferences:

1. MRADE/WCRLA 1985 Conference of the combined Midwest Regional Association for Developmental Education (MRADE) and Western College Reading and Learning Association (WCRLA), November, 1985. This presentation covered uses of microcomputers for disabled college students.

2. Regional Conference for the League of Human Dignity, April, 1986. This presentation provided a description of Center activities and a summary of interventions developed.

3. AHSSPPE '86, Charting the Course: Directions in Higher Education for Disabled Students, July, 1986. This presentation at the annual conference of the Association on Handicapped Student Service Programs in Post-Secondary Education covered technology and cognitive skills interventions for disabled college

students.

These presentations were well received by participants and provided information on the Center to a wide range of disability service personnel and educators.

Two first year publications were completed. The first, titled "Microcomputers and the Disabled College Student" covered material in the MRADE/WCRLA presentation and was published in the conference proceedings. The second titled "Survival Skills for Disabled College Students: Computer Technology and Cognitive Skills Training" was submitted and accepted for publication in the AHSSPPE Conference proceedings.

Additional first year activities have included providing tours of the Center for public school and vocational rehabilitation services personnel. Also, Center staff have been participating in a resource group with other professionals working in the field of technology for the disabled. This group includes professionals from early childhood, elementary, secondary and post-secondary educational services and from vocational rehabilitation services. The group provides a means for Center information to be distributed to a variety of professionals and for the Center to receive new information about the field.

The preponderance of Center dissemination activities to professionals will occur in the second and third years of the project as interventions are finalized and evaluation results are obtained. During the first year staff have submitted proposals for conference presentations during the second year. To date proposals have been submitted for the following conferences during 1986-87.

1. Conference on College Composition and Communication (CCCC) Annual Convention (National Council of Teachers of English), March 19-21, 1987.

2. Council for Exceptional Children (CEC) 65th Annual Convention, April 20-24, 1987.

3. Closing the Gap 4th Annual Conference on Microcomputer Technology for Special Education and Rehabilitation, October 23-25, 1986.

4. International Reading Association 32nd Annual Convention, May 3-7, 1987.

5. EVALUATION '86 Conference, October 30-31, 1986.

In July, proposals for Closing the Gap and EVALUATION '86 were accepted. Presentation at the remaining conferences is contingent on acceptance of proposals; however, Center staff

are confident that other proposals will be accepted. An additional proposal will be sent for the 1987 AHSSPPE Conference when the call for papers is received. Papers will be submitted in conjunction with most presentations for publication in conference proceedings or professional journals.

These presentations should provide information on the Center to a diverse population of educational and service professionals. It is important that information about technological interventions for input-output limitations, particularly reading and writing, reach a wide range of educators beyond traditional special services providers. Through dissemination to the broad spectrum of educational professionals the likelihood that interventions developed at the Center will be utilized at all educational levels will be increased. Center staff will continue to monitor dissemination opportunities as they become available and will pursue presentation opportunities at relevant identified forums.

The final area of dissemination activities is the business community. If disabled students are to effectively move into employment following school, employers must be made aware of the skills possessed by students and the types of adaptations available to allow the disabled to be as productive as non-disabled employees. As adaptive technology that allows the disabled to utilize computers in productive fashion is developed the business community must be kept up to date on the current technology. Evaluation Plan Objective 3.5 directs staff to pursue opportunities for dissemination to this group.

Since first year activities were directed at identifying available technology and developing intervention strategies for using this technology, formal dissemination to the business community was not undertaken. Center staff have, however, been in contact with the IBM Corporation concerning dissemination. Contact was made with the newly established National IBM Disabilities Service Office, which was provided with information on Center uses of technology to aid the disabled. A local IBM representative has toured the Center and interviewed staff for the possible purpose of preparing material on the Center for distribution to IBM offices and affiliated post-secondary institutions. While still in the planning stages these contacts have provided the Center with a possible national dissemination network to businesses and universities. Work will continue in this area during the second year.

The staff will also begin identification of relevant forums for presentation to employers during the second year. As ways of dissemination are identified, staff will pursue opportunities through presentation proposals and paper

submission. It is hoped that a dissemination network to the business community can be developed during the second year.

These dissemination activities insure that information about the Center will reach the three target groups of interest: prospective students and their parents, service and educational professionals, and the business community. The Evaluation Plan, in Objective 3.2, specifies that the Center will develop and update materials relevant to each audience so that dissemination information is current. Materials are prepared for dissemination as new information is obtained and all materials are reviewed semi-annually for completeness. Center dissemination activities insure that the goal of providing information to interested parties is met.

An additional area of dissemination involves the placement of interns with the Center. By allowing interns the opportunity to work with Center equipment and interventions, students training to work in education, special education and rehabilitation can be made aware of available technological and skill training interventions. As these students move into employment, knowledge of the Center will go with them and be disseminated to service and educational agencies. Objective 3.6 directs the staff to explore and provide internship opportunities to interested students.

One intern was placed with the Center during the second semester of the first year. Arrangements are being made with the Department of Human Development and the Family at the University to place students working in the area of rehabilitation with the Center. In addition, internship opportunities will be listed with the Office of Experiential Education at UNL to provide knowledge of available internships to the general student population.

III. SECOND YEAR ACTIVITIES AND TIMELINES

Second year activities have been organized around the objectives specified in the Evaluation Plan. Appendix C provides the implementation schedule for activities related to each objective. The schedule provides the proposed timelines for the completion of activities related to each objective and indication of when scheduled reports are due. This section will provide a summary of second year activities and highlight major goals and reports.

The second year will see a shift in the focus of Center activities. First year activities have primarily involved identification of relevant equipment and software and the development of effective interventions for utilizing identified materials. As a result of these activities the Center is now established. While continued identification and procurement of new equipment will be done, the primary emphasis of second year activities will be on finalizing the interventions utilizing the equipment and skill training materials obtained and on documenting the effectiveness of these interventions. This involves a shift from development activities and formative evaluation to implementation and summative outcome evaluation.

Outcome evaluation activities are detailed in the Summative Evaluation Plan provided in Appendix D. Three types of evaluation are specified in this plan. First, student educational progress will be assessed. This evaluation involves examining admissions and drop-out rates for disabled students, grades and credit hour loads. It is anticipated that Center interventions will improve the scholastic performance of disabled students resulting in higher grades. Also, it is a goal of the Center to allow disabled students to compete on an equal basis with non-disabled students which should result in disabled students maintaining the same class loads and length of attendance as the general student population. It is also thought that availability of Center services will increase the number of disabled students electing to pursue a college education.

These outcomes will be assessed annually by comparing data on drop-out rate, enrollment, grade point average and average credit hour load to the figures for the previous year. Data collection is scheduled for June for drop-out rates, grades and credit hour loads and for September for enrollment with analysis to be completed during the first semester (September -December). The report on these outcomes is scheduled for completion by February 1. For the first evaluation a tabulation of data will be done in January, 1987 to provide preliminary comparisons to June, 1986 figures. The report on these results is scheduled for March 1, 1987. Following this initial report the annual schedule will be maintained for future evaluations.

The second outcome area to be assessed is improvement in student writing. It is thought that availability of the technological interventions and skill training for alleviating output limitations should allow students to improve their writing skills and the quality of written output produced. This will be assessed by two means. First, writing samples will be obtained at the beginning of the school year (September) or at entry to the program. The quality of writing will be compared between the last two samples obtained. These samples will also be obtained from a control group of disabled students not using the Center to provide better statistical control and analysis. For purposes of initial evaluation a writing sample will be obtained in December, 1986. Following this initial sample future evaluations will be done on an annual basis in September as specified in the Evaluation Plan. Data analysis on the initial evaluation will be done in January and February of 1987 with the initial results due March 1.

A second analysis will be performed utilizing logs kept on use of Center equipment and skill training. These logs detail the amount of time each student has spent using Center facilities. Tabulation of student use will allow correlations to be determined between amount of use and use of particular equipment or training materials and improvement in writing. This will help identify specific aspects of Center interventions which relate to improvement in writing. For the first evaluations data will be analyzed during January and February with the report due March 1.

The third outcome area to be assessed is improvement in student attitudes and self-perceptions about school and their abilities. Data for this assessment is collected on the Intake/Attitude Survey Instrument completed on entry to the program and annually at the beginning of the school year (September). Data collection and summary are done by Dr. John Berman, Department of Psychology, University of Nebraska-Lincoln as an outside evaluation of the Center. Center staff use the summary information to compare change between surveys. Three areas are assessed by the Center: 1) time spent on the mechanics of school work, eg. studying, writing, etc.; 2) self-perception of ability to do school work; and 3) attitudes (like or dislike) of school related activities. These comparisons allow staff to assess whether Center interventions are effective in allowing disabled student to perform the same work as non-disabled students, improve student perceptions of ability and increase positive attitudes toward school. The report on these evaluations is scheduled for completion February 1.

All of the summative activities are designed to assess the impact of Center activities on students. They will allow staff to know whether the Center is effective in facilitating positive change in student performance and attitudes. They

will also allow staff to assess which specific aspects of Center interventions seem most effective. This information is required if Center facilities and interventions are to be replicated by others.

While the main focus of second year activities will be on summative evaluation, continued monitoring and reporting on formative activities will be done. The Objective Implementation Schedule indicates when formative activities are to be performed for each objective in the evaluation plan. Reports on these activities are scheduled for February and August in conjunction with the six-month and annual progress reports.

The following table provides a summary of second year activities and when major reports will be completed during the second year.

SECOND YEAR ACTIVITY SUMMARY

Activity	Timeline	Report Date
Evaluation of Educational Progress (Objective 1.5)	June, January-February	3/01/87
Evaluation of Student Writing (Objective 1.6)	December-February	3/01/87
Evaluation of Student Attitudes (Objective 1.7)	September-January	2/01/87
Student Needs Assessment (Objectives 1.1, 2.11, 2.12)	August-September January-February	10/15/86 3/15/87
Review of Equipment and Software (Objectives 2.21, 2.22)	August-October January-March	11/01/86 4/01/87
Obtain equipment (Inventory Report) (Objectives 2.31,2.32)	October-December March-July	2/15/87 8/15/87
Adjunctive Services Review (Objective 2.41)	August-September	11/01/86
Evaluation Plan Update (Objective 2.51)	August-September	10/15/86
Evaluation Plan Reports (Objective 2.52)	December-January June-July	2/15/87 8/15/87
Progress Reports		
Six Month	January-February	3/15/87
Year End	June-July	9/01/87

IV. SUMMARY AND CONCLUSIONS

Summary

This report has detailed first year activities and findings of the Educational Center for Disabled Students at the University of Nebraska-Lincoln. First year activities have focused on development of the Center through identification of what technology was available, obtaining technological and supplemental equipment and materials, and determining how these materials could best be utilized to aid disabled students. Since the Center was a pioneering project in providing technological assistance to the disabled, there were few established guidelines that staff could follow in the development of the Center. This made establishment of the Center a difficult process as each step in development identified new issues to be dealt with. The existence of an equipped center with assessment instruments, technological and skills training interventions, and formative and summative evaluation plans is testament to the success of first year activities and the dedication and efforts of staff.

Major first year highlights, with reference to sections of this report containing detailed information, were:

1. The development of formative and summative evaluation plans to guide development activities and assess the effectiveness of Center facilities and interventions. (Section II-A)

2. Delineation of the population characteristics of the students to be served by the Center. (Section II-B)

3. Development of the IPO (Input-Processing-Output) Model for assessment and intervention. (Section II-B)

4. Development of an assessment instrument and interview to determine technological and skills training interventions needed by students. (Section II-B)

5. Identification and acquisition of technological equipment and software that can be used to provide interventions designed to alleviate or compensate for disability related limitations on sensory or motor skill functions. (Section II-C)

6. Identification of educational skills training needed to supplement and/or enhance technological interventions and acquisition or development of materials to meet these needs. (Section II-D)

7. Formulation and initial development of a cognitive skills training program to provide educational skills training for reading comprehension, writing and notetaking. (Section II-D)

8. Publication of the initial newsletter and completion of two conference presentations and one publication describing the Center. (Section II-E)

Center staff are proud of these accomplishments and feel that the Center is able to effectively meet the needs of the disabled students it serves. Staff also feels that the information gained in development activities will prove useful to other projects wishing to provide similar services.

Conclusions

While first year activities were formative in nature, some tentative conclusions about uses of technology for the disabled and recommendations for service providers are possible. This final section of the report will summarize conclusions reached by Center staff.

First, it was determined that technology can indeed be effectively used to assist disabled students in performing educational tasks. A wealth of computers, equipment and software exists that can be used by the disabled to perform a variety of tasks. Adaptive devices exist which can allow disabled persons to make full use of the capabilities of computers. This technology does, however, have limitations and is not a panacea for all problems encountered by the disabled.

Technology is primarily applicable to the solution of problems involving sensory input or motor skills. Computers can allow disabled students to obtain information that they could not normally receive. Computers can also compensate for motor skill deficiencies by allowing disabled persons to complete otherwise impossible tasks, such as writing. Technology cannot, however, supply students with missing knowledge or cognitive and behavioral skill. The storing of information in memory and the use of this information to develop skilled performance are tasks that must be performed by the person.

This means that any use of technology must be paired with assessment of knowledge and performance skills. Where students are deficient in needed educational skills these must be trained if the student is to make full use of the potential provided by technological devises. A computer room by itself is therefore, insufficient for aiding the disabled. Any program desiring to provide technological assistance to the disabled must provide a comprehensive service program or be able to refer the student to other services in conjunction

with the program.

The second conclusion that can be made is that disabled students often require few specialized adaptive devises or programs to use the computer. The most important considerations for providing computer access to the disabled are those concerning the basic equipment and software used. The right combinations of standard off-the-self equipment and programs can eliminate any need for adaptive equipment and alternative input or output methods.

The primary considerations in selecting equipment and software are ease and simplicity of use. Computers and programs that can be accessed with single keystroke commands can be operated by a single stick typist with no modifications to the computer. Thus, computers that provide single stroke function keys on the keyboard and software that uses these keys for commands are the best equipment for the disabled. Computers and programs that require commands to be entered by striking multiple keys should be avoided. If equipment and programs are selected carefully the need for adaptive devices and specialized programs can be lessened and in some cases eliminated. All physically disabled and learning disabled students served by the Center to-date have been able to use the computers and programs with no modifications even though the Center has alternative input devices available.

There are a number of advantages to limiting the need for adaptive equipment. First, the student is able to use the same equipment and programs that non-disabled students use. This means that the student is not restricted to having computer access only at a specialized center. Second, the student is better able to transfer their computer knowledge and skill to the work place, since they are using the same equipment and programs they are likely to encounter on the job. Third, standard equipment and programs are generally much less expensive than specialized adaptive equipment so the student is better able to purchase computers and programs for personal use. Finally, businesses are more likely to be receptive to the hiring of disabled persons if these persons are able to be productive on the businesses existing equipment and the company does not have to supply expensive specialized equipment or modifications.

The final conclusion reached by staff is that use of technology to alleviate sensory and motor skill problems must be implemented throughout the educational system. Students who do not receive technological interventions until college or even high school often miss out on a significant portion of the educational process. These students may suffer from extensive knowledge and skill deficits related to the inability to obtain needed information or practice skill areas.

If technology is to truly succeed in providing disabled students with equal educational opportunities and an equal educational experience, technological interventions must be begun at the student's initial entry into the educational system. This means that technological intervention must be undertaken in the primary schools and continued throughout high school and college. If this was done most of the needs for compensatory academic skills identified by the Center would be eliminated.

These initial conclusions and recommendations reflect knowledge gained from development activities undertaken to establish the Center. More detailed and documented conclusions and recommendations will be possible as summative evaluation activities progress during the second year and beyond.

Educational Center for Disabled Students Evaluation Plan
Formative Evaluation

Program Goals and Objectives	Evaluation Objectives
1.0 Goal: Improve Student Academic Performance and Attitudes.	
1.1 Evaluate student needs for adaptive hardware/software and skill training in academic areas.	Evaluation completed for each student.
1.2 Provide training in adaptive hardware/software for areas identified in evaluation.	Adaptive hardware/software training completed on schedule.
1.3 Provide training in academic skill areas identified in evaluation.	Academic skill training completed on schedule.
1.4 Evaluate student progress in use of adaptive hardware/ software and development of academic skills.	Progress evaluations completed on schedule.
1.5 Evaluate educational progress of students in the program.	Summative evaluation of academic progress completed on schedule.
1.6 Evaluate progress in student writing resulting from use of adaptive hardware/ software.	Summative evaluation of writing progress completed on schedule.
1.7 Evaluate student attitudes toward school and perceptions of ability to perform school related tasks.	Summative evaluation of attitudes and perceptions completed on schedule.

Program Goals and Objectives		Evaluation Objectives
2.0	Goal: Establish Educational Center for Disabled Students.	
2.11	Conduct adaptive hardware/ software needs assessment for student population in program.	Adaptive hardware/software needs assessment completed each semester.
2.12	Conduct educational needs assessment for student population in program.	Educational needs assessment completed each semester.
2.21	Conduct assessment of available adaptive hardware and software for meeting needs identified in needs assessment.	Adaptive hardware/software availability assessment completed each semester.
2.22	Conduct assessment of available educational software for meeting needs identified in needs assessment.	Educational software availability assessment completed each semester.
2.31	Obtain adaptive hardware and software to meet identified needs.	Complete acquisition of hardware and software each semester.
2.32	Obtain educational software to meet identified needs.	Complete acquisition of educational software each semester.
2.41	Conduct survey of adjunctive services available at the University of Nebraska and in the community.	Adjunctive services survey completed annually.
2.42	Arrange cooperative agreements between center and identified adjunctive service organizations.	Cooperative agreements completed annually.
2.51	Develop evaluation plan for center activities.	Evaluation plan completed and updated annually.
2.52	Evaluate center and center activities.	Evaluation completed in accordance with annual evaluation plan.
2.6	Obtain additional funding for the center.	Additional funding sources obtained.

Program Goals and Objectives		Evaluation Objectives
3.0	Goal: Disseminate Model Project Information.	
3.1	Publish newsletter on center activities.	Newsletter published on schedule.
3.2	Compile dissemination materials on center and center activities for publication and presentation.	Dissemination materials completed semi-annually.
3.3	Provide information on adaptive hardware/software and training to education and service professionals.	Complete workshops, training sessions, and publications for service and education personnel.
3.4	Provide information about the center to prospective students and parents.	Complete publications and presentations for prospective students and their parents.
3.5	Educate the business community concerning adaptive hardware/software for the workplace.	Complete publications and presentations for business organizations.
3.6	Provide internship opportunities at the center for students interested in disability and rehabilitation issues.	Complete placement of interns with the center.
3.7	Conduct testing of prototype adaptive hardware/software.	Prototype hardware/software obtained and tested.

Evaluation Plan
Summary Report

1.0 Goal: Improve Student Academic Performance and Attitudes.

	Program Objective	Status	Product or Comment
1.1	Evaluate student needs for adaptive hardware/software training in academic areas	1	Needed evaluation information identified, instrument completed and data collection completed.
1.2	Provide training in adaptive hardware/software for areas identified in evaluation.	3	Technological interventions identified; training activities initiated.
1.3	Provide training in academic skill areas identified in evaluation.	3	Skill training interventions identified; software and materials being developed and evaluated.
1.4	Evaluate student progress in use of adaptive hardware/software and development of academic skills.	3	Use logs for time on equipment and software implemented. Skill assessments scheduled for Spring 1986.
1.5	Evaluate educational progress of students in the program.	7	Scheduled for 1986-87 academic year per evaluation plan.
1.6	Evaluate progress in student writing resulting from use of adaptive hardware/software.	3	Preliminary writing samples obtained from center students and controls. On schedule per evaluation plan.
1.7	Evaluate student attitudes toward school and perceptions of ability to perform school related tasks.	3	Initial survey and preliminary report completed. Further surveys scheduled as per evaluation plan.

Status Codes

1 = Completed as planned
2 = Completed - deviated from plan
3 = In progress - satisfactory
4 = In progress - unsatisfactory
5 = Initiation deferred
6 = Activity abandoned
7 = Not scheduled this period

2.0 Goal: Establish Educational Center for Disabled Students.

Program Objective	Status	Product or Comment
2.11 Conduct adaptive hardware/ software needs assessment for student population in program.	1	Identification of general adaptive equipment for global categories (physical, hearing, visual, LD) complete. Identification of specific needs completed.
2.12 Conduct educational needs assessment for student population in program.	1	Initial needs survey complete. Identification of specific needs complete
2.21 Conduct assessment of available adaptive hardware and software for meeting needs identified in needs assessment.	1	Initial identification of available hardware/ software completed through survey of catalogs, journals and attendance at Closing The Gap conference.
2.22 Conduct assessment of available educational software for meeting needs identified in needs assessment.	1	Initial identification of available educational software completed through survey of catalogs, journals, attendance at Closing The Gap conference, and contact with vendors.
2.31 Obtain adaptive hardware and software to meet identified needs.	1	Purchase of computers printers, voice output devices, switches, other peripherals, word processing software and typing software for meeting initial needs completed.

Program Objective		Status	Product or Comment
2.32	Obtain educational software to meet identified needs.	2	Testing of available software showed deficiencies in meeting needs of college level students. Purchase of writing development and general knowledge software completed. Assessment of additional software continuing.
2.41	Conduct survey of adjunctive services available at the University of Nebraska and in the community.	7	Survey scheduled for 1986-87 academic year per evaluation plan.
2.42	Arrange cooperative agreements between Center and identified adjunctive service organizations.	3	Obtaining cooperative agreements scheduled for 1986-87 academic year per evaluation plan; however, one agreement completed to date.
2.51	Develop evaluation plan for Center activities.	1	Initial evaluation plan completed.
2.52	Evaluate Center and Center activities.	1	First year evaluation completed.
2.6	Obtain additional funding for the Center.	3	Local funding obtained from University Foundation for further equipment and satellite stations. Further funding being pursued.

Status Codes

1 = Completed as planned
2 = Completed -deviated from plan
3 = In progress - satisfactory
4 = In progress - unsatisfactory
5 = Initiation deferred
6 = Activity abandoned
7 = Not scheduled this period

3.0 Goal: Disseminate Model Project Information.

Program Objective		Status	Product or Comment
3.1	Publish newsletter on Center activities.	1	First year newsletters completed on schedule.
3.2	Compile dissemination materials on Center and Center activities for publication and presentation.	7	Scheduled to initiate in 1986-87 program year.
3.3	Provide information on adaptive hardware/software and training to education and service professionals.	3	Main dissemination scheduled for 1986-87 program year. Three professional conference presentations and demonstrations for faculty and local service persons completed to date.
3.4	Provide information about the Center to prospective students and parents.	3	Completion of program brochure in progress. Informal contact with students and parents on an ongoing basis. Main activity scheduled for 1986-87 year.
3.5	Educate the business community concerning adaptive hardware/ software for the work place.	7	Formal activities scheduled for 1986-87 program year.
3.6	Provide internship opportunities at the Center for students interested in disability and rehabilitation issues.	3	Placement of initial intern completed. Arrangements for future interns in progress.
3.7	Conduct testing of prototype adaptive hardware/ software.	7	Formal testing to begin in 1986-87 year.

Status Codes

1 = Completed as planned
2 = Completed -deviated from plan
3 = In progress - satisfactory
4 = In progress - unsatisfactory
5 = Initiation deferred
6 = Activity abandoned
7 = Not scheduled this period

EDUCATIONAL CENTER FOR DISABLED STUDENTS

OBJECTIVE IMPLEMENTATION SCHEDULE

----- Proposed timeline
_____ Implemented timeline
I Initiated
C Completed
X Scheduled Report

Goal: Improve Student Academic Performance and Attitudes

		1986-1987											
		AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
1.1	Evaluate adaptive hardware/software and skill training needs	---	---	X			---	---	X				
1.2	Provide training in adaptive hardware/ software		---	---	---	---		---	---	---	---	---	---
1.3	Provide training in academic skills		---	---	---	---		---	---	---	---	---	---
1.4	Evaluate student progress in use of adaptive hardware/software and skills			---		---		---		---			
1.5	Evaluate student educational progress						---	---	X			---	
1.6	Evaluate student writing progress					---	---	---	X				
1.7	Evaluate student attitudes		---	---	---	---	---	X					

EDUCATIONAL CENTER FOR DISABLED STUDENTS

OBJECTIVE IMPLEMENTATION SCHEDULE

Goal: Establish Educational Center for Disabled Students

----- Proposed timeline
_____ Implemented timeline
I Initiated
C Completed
X Scheduled Report

		1986-1987 AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
2.11	Conduct adaptive hardware/software needs assessment	---	---	X			---	---	X				
2.12	Conduct educational needs assessment	---	---	X			---	---	X				
2.21	Conduct assessment of available adaptive hardware and software	---	---	---	X		---	---	---	X			
2.22	Conduct assessment of available educational software	---	---	---	X		---	---	---	X			
2.31	Obtain adaptive hardware/software	X		---	---			X	---	---	---	---	---
2.32	Obtain educational software	X		---	---			X	---	---	---	---	---
2.41	Conduct survey of adjunctive services	---	---		X								
2.42	Arrange cooperative agreements	---	---	---	---								
2.51	Develop Evaluation Plan	---	---	X									
2.52	Evaluate Center	X				---		X				---	
2.6	Obtain additional funding	---	---	---	---	---	---	---	---	---	---	---	---

EDUCATIONAL CENTER FOR DISABLED STUDENTS

OBJECTIVE IMPLEMENTATION SCHEDULE

----- Proposed timeline
_____ Implemented timeline
I Initiated
C Completed
X Scheduled Report

Goal: Disseminate Model Project Information

		1986-1987										
		AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
3.1	Publish Newsletter	---	X		---	X		---	X		---	X	
3.2	Compile dissemination materials for publication and presentation			----------						----------			
3.3	Provide information and training to education and service professionals	----------											
3.4	Provide information about Center to prospective students and parents	----------											
3.5	Educate business community on workplace adaptations	----------											
3.6	Provide internship opportunities	---------					---------						
3.7	Conduct testing of prototype hardware/software			----------					----------				

EDUCATIONAL CENTER FOR DISABLED STUDENTS
SUMMATIVE EVALUATION

Program Goal 1.0 - Improve student academic performance and attitudes

Objective 1.5 - Evaluate educational progress of students in the program

EVALUATION OBJECTIVE	MEASUREMENT		DATA COLLECTION		DATA ANALYSIS	
	INSTRUMENTS	BASELINE	METHOD	SCHEDULE	DESIGN	GROUPS/MEASURES
1. Reduce drop-out rate for disabled students to levels equivalent to non-disabled student population	UNL Records	Current drop-out rates	Obtain average UNL drop-out rate and calculate drop-out rate for center students and general disabled population.	Annually at the end of school year - June	Between Groups Comparison	1a. General student population 1b. Center students 2a. General disabled population 2b. Center students
2. Increase percentage of disabled students admitted to the university	UNL Records	Current admission percentages	Obtain number of admissions for all students and for disabled students and calculate annual percentage	Annually at the beginning of school year - Sept.	Pre - Post comparison	1a. Percentage previous year 1b. Percentage current year
3. Increase overall grade average for students in center	UNL Records	Current cummulative GPA for center students	Obtain GPA for each center student and compute average GPA	Annually at the end of school year - June	Pre - Post Comparison	1a. GPA previous year 1b. GPA current year
4. Increase semester credit hour load to levels equivalent to non-disabled student population	UNL Records	Current credit hour loads for disabled and non-disabled students	Obtain average credit hours per semester for all UNL students. Obtain credit hours per semester for each student in center and average.	Annually at the end of school year - June	Between Groups Comparison	1a. General student population 1b. Center students

EDUCATIONAL CENTER FOR DISABLED STUDENTS
SUMMATIVE EVALUATION

Program Goal 1.0 - Improve student academic performance and attitudes

Objective 1.6 - Evaluate progress in student writing resulting from use of adaptive hardware/software

EVALUATION OBJECTIVE	MEASUREMENT		DATA COLLECTION		DATA ANALYSIS	
	INSTRUMENTS	BASELINE	METHOD	SCHEDULE	DESIGN	GROUPS/MEASURES
1. Increase writing abilities of students in center relative to disabled students not in center	Writing samples	Preliminary writing score	Collect writing samples from students in center and group of disabled students not in center. Score pre and post samples blind using holistic scoring.	Test at beginning of school year (Sept.) or at entry to program.	Between groups pre - post comparison, using last two writing samples.	1a. Disabled students not in center (Control) 1b. Center students (Experimental)
2. Determine degree of relationship between use of center equipment and improvement in writing	Writing samples (Criterion) Use logs (Predictor)	N/A	Collect writing samples from students in center. Score pre and post samples blind using holistic scoring and compute difference score for each student. Compute total center use time and time on specific equipment from logs for each student.	Test at beginning of school year (Sept.) or at entry to program for writing sample. End of school year for log summary.	Regression of log data on writing difference scores	1a. Writing difference scores (Criterion) 1b. Total use time for center (Predictor) 1c. Use time for specific equipment (Predictor)

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EDUCATIONAL CENTER FOR DISABLED STUDENTS
SUMMATIVE EVALUATION

Program Goal 1.0 - Improve student academic performance and attitudes

Objective 1.7 - Evaluate student attitudes toward school and perceptions of ability to perform school related tasks

EVALUATION OBJECTIVE	MEASUREMENT		DATA COLLECTION		DATA ANALYSIS	
	INSTRUMENTS	BASELINE	METHOD	SCHEDULE	DESIGN	GROUPS/MEASURES
1. Decrease time spent on mechanics of school related tasks	Attitude survey Questionnaire	Intake survey score	Collect attitude survey questionnaires from all students in program. Compile group average for time spent in educational tasks.	Beginning of each school year - Sept.	Pre - Post Comparison (Annual)	1a. Time beginning of previous year 1b. Time beginning of current year
					Pre - Post Comparison (Initial)	2a. Time at intake 2b. Time last survey
2. Improve student self perception of academic ability	Attitude survey Questionnaire	Intake survey scores	Collect attitude survey questionnaires from all students in program. Compile group average for self perception of academic ability	Beginning of each school year - Sept.	Pre - Post Comparison (Annual)	1a. Perceptions beginning of previous year 1b. Perceptions beginning of current year
					Pre - Post Comparison (Initial)	2a. Perceptions at intake 2b. Perceptions last survey
3. Improve student attitudes toward school	Attitude survey Questionnaire	Intake survey scores	Collect attitude survey questionnaires from all students in program. Compile group average for attitudes toward school.	Beginning of each school year - Sept.	Pre - Post Comparison (Annual)	1a. Attitudes beginning of previous year 1b. Attitudes beginning of current year
					Pre - Post Comparison (Initial)	2a. Attitudes at intake 2b. Attitudes last survey

EDUCATIONAL CENTER FOR DISABLED STUDENTS
INTAKE NEEDS ASSESSMENT

Name: Sex:

Social Security No.: Date of Birth:

Assessment Date: High School GPA:

College: Major:

ACT: Eng: Math: SS: NSc: Com:

GPA at Entry: Current GPA:

DISABILITY CLASSIFICATION

Primary: Code#:
Secondary: Code#:
Other: Code#:

DISABILITY INFORMATION

PHYSICAL

Hand Usage (L,R,B,N):
Coordination:
Fatigue:

Finger Usage
Left Hand (Y,N):
Identify:
Coordination:
Fatigue:

Right Hand (Y,N):
Identify:
Coordination:
Fatigue:

Other Mobility
Arm Usage (L,R,B,N):
Coordination:
Fatigue:
Foot Usage (L,R,B,N):
Coordination:
Fatigue:
Head Mobility (Y,N):
Fatigue:
Eye Blink (Y,N):
Fatigue:

General Body Fatigue
Standing:
Sitting:

HEARING

Ability (H,M,L,N):
Aids Used
Hearing Aid (Y,N):
Lip Reading (Y,N):
Signing (Y,N):
Other:

VISION

Ability (H,M,L,N):
Aids Used
Specify:

Other Visual Problems
Specify:

SPEECH

Ability (H,M,L,N):
Aids Used:

LEARNING DISABILITY

Perceptual Problems (Y,N):
Specify:
Severity (H,M,L):

General Disability (Y,N):
Specify:
Severity (H,M,L):

Mental Fatigue (Y,N):
Max. Work Time:

Reading (Y,N):
Specify:
Severity (H,M,L):

Other Language (Y,N):
Specify:
Severity (H,M,L):

On Task Problems (Y,N):
Specify:
Max. Work Time:

EDUCATIONAL ASSESSMENT

Reading
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):

Writing
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):

Study Skills
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):

Typing
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):
Touch Type (Y,N):

Notetaking
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):

Computer Usage
Level (H,M,L,N):
Impairments
Physical (Y,N):
Visual (Y,N):
L.D. (Y,N):
Hearing (Y,N):

COMPUTER SKILLS

Word Processing
PFS Write (Y,N):
Word Perfect (Y,N):
Other (Y,N):
Specify:

Spread Sheets
PFS Plan (Y,N):
Lotus (Y,N):
Other (Y,N):
Specify:

General
Autocad (Y,N):
PFS Plan (Y,N):
Other (Y,N):
Specify:
Specify:

Operations Ability
Start-Stop (Y,N):
Insert Disks (Y,N):
Operate Printer (Y,N):
Drive Assignments (Y,N):

General Operations Knowledge
Drive Assignments (Y,N):
Format/Copy (Y,N):
Boot Program (Y,N):
Save Files (Y,N):

RECOMMENDATIONS

Equipment:

Educational:

E.C.D.S. PROGRAM EVALUATION

A. DEMOGRAPHICS

First we need to ask you some questions about yourself.

1-2. age: _____

3. sex: Male (a) _____ Female (b) _____

4. Major: _____

5. Handicap _____

6. Before this program, have you had (or did you have) any past experience with computers? Yes (a) _____

No (b) _____

(If no, go to #11)

(If yes, ask)

7. Do you own or have access to a computer? Yes (a) _____

No (b) _____

8. If yes, how often do you use it for coursework?

(a) Never _____ (b) Seldom _____ (c) Sometimes _____ (d) Frequently _____

9. Have you ever taken a computer course? Yes (a) _____

No (b) _____

10. How would you describe your frequency of use?

Have just used a few times. (a) _____

Have used quite a bit. (b) _____

11. To what extent do you feel intimidated by computers?

(a) Not at all _____ (c) A fair amount _____

(b) A bit _____ (d) A lot _____

12. What type of course do you do best in? (check one)

(a) English Composition: _____

(b) Foreign Languages: _____

(c) Humanitities (i.e., Literature, Philosophy, History) _____

(d) Physical Sciences (i.e., Math, Physics, Engineering) _____

(e) Life Science (i.e., BIology, Botany, Physiology) _____

(f) Social Science (i.e., Political Science, Psychology, Sociology, Speech Communication _____

(g) Business _____

(h) Arts (Drawing, Music) _____

13. What type of course do you do worst in? (check one)

(a) English Composition: _____

(b) Foreign Languages: _____

(c) Humanitities (i.e., Literature, Philosophy, History) _____

(d) Physical Sciences (i.e., Math, Physics, Engineering) _____

(e) Life Science (i.e., Biology, Botany, Physiology) _____

(f) Social Science (i.e., Political Science, Psychology, Sociology, Speech Communication) _____

(g) Business _____

(h) Arts (Drawing, Music) _____

14-15. When you are attending school, how many hours per week do you usually spend on school work? _____

16-17. Approximately how many papers have you written for courses at the University? _____

18-19. Approximately how many essay tests have you taken? _____

20. (If they have written or taken any, ask:) What procedures did you use? e.g., do you type it yourself? do you have it typed? do you tape it? (record their answer)

21-22. When you are attending school, how many hours per week do you usually spend on written work? _____

When you have trouble in a course, how frequently is it due to each of the following factors?

(a) never (b) rarely (c) sometimes (d) frequently (e) always

23. You have not tried hard enough _____
24. You do not have natural academic ability in that area _____
25. Your handicap interferes _____
26. Your teacher does not understanding your learning needs _____
27. Your teacher does not understand your physical limitations _____

When you are successful in a course, how frequently is it due to the following factors? (use the same alternatives as above)

28. You worked very hard _____
29. You have natural academic ability in that area _____
30. Your handicap does not interfere _____
31. Your teacher understands your learning needs _____
32. Your teacher understands your physical limitations _____

There are many ways to spend time studying for a course. We would like to know how you distribute your study time. Indicate what percentage of your study time you devote to each of the activities listed below. Remember the percentages you give must add to 100%.
(I will read them first; then try to put percentage time for each one.)

The various study activities are:

33-34. Reading required material: _____

35-36. Writing and preparing papers for class: _____

37-38. Working on other written homework (i.e., workbooks, study guides): _____

39-40. Studying for tests: _____

41-42. Other: _____

43-46. What do you think your GPA will be next semester? _____

47-48. Approximately 50% of the people who start college actually graduate. What do you think are the chances that you will complete college? _____%

Using a scale from 1 = not at all confident to 5 = very confident, how confident are you of your ability in each of the following types of courses?

1	2	3	4	5
Not at all Confident				Very Confident

49. English Composition: _____
50. Foreign Languages: _____
51. Humanitities (i.e., Literature, Philosophy, History) _____
52. Physical Sciences (i.e., Math, Physics, Engineering) _____
53. Life Science (i.e., Biology, Botany, Physiology) _____
54. Social Science (i.e., Political Science, Psychology, Sociology, Speech Communication) _____
55. Business _____
56. Arts (Drawing, Music) _____
57. Classes with essay tests _____
58. Classes with only multiple choice tests _____
59. Classes with labs _____
60. In what way do you think the computers connected to this program will be useful to you? _____

61. When you set goals for yourself, do you typically:

(a) set them about right and reach them _____

(b) set them too low, reach them easily and wish you had set them higher _____

(c) set them too high, fail to reach them, and get discouraged _____

62-64. What problems do you have at the University because of your handicap?

Academically?

Socially?

Practical matters like getting around?

65. What do you see yourself doing after graduation?

66-67. Before this interview, approximately how many hours have you spent with the equipment in this program? _____

68. List some occupations at which you think you could do well.

CRITERIA FOR EVALUATION

I. CONVENTIONS

A. Noun/Verb Agreement

High — All nouns and verbs are in agreement.

Low — There are noun/verb disagreements even in the simplest sentences.

B. Correct Word Usage

High — Words such as their/there, capital/capitol, affect/effect are always used correctly and who, whom, that are used correctly.

Low — There are many usuage problems.

C. Spelling

High — All words are spelled correctly.

Low — There are many misspellings and many of the misspelled words are common.

E. Proper Pronoun Reference

High — All pronouns have antecedents.

Low — There are many pronoun errors and they cause confusion.

F. Punctuation

High — Punctuation occurs at natural places, thus making the paper easy to understand.

Low — There are numerous errors in punctuation making the essay hard to understand.

G. Capitalization

High — All capitalization is done correctly.

Low — There are many errors in capitalization including commonly capitalized terms.

II. SYNTACTIC MATURITY

A. Sentence Structure

High — The writer uses complete sentence construction

with no fragments, run-ons or incorrect word order. The writer uses subordination when appropriate.

Low — There are numerous sentence fragments and run-ons and little indication that sentence structure is understood. The writer uses little or no subordination.

B. Clarity

High — The writer shows proficiency in communicating in a clear manner without making ambiguous or confusing statements.

Low — The writer is consistently writing sentences that are confusing.

III. STYLE

A. Point of View.

High — The point of view remains consistent throughout the paper: there are no shifts in pronouns, verb tense or in what's going on in the paper.

Low — There are numerous inconsistencies in point of view which make understanding difficult.

B. Word Appropriateness

High — Word choice is precise and avoids cliches and vagueness. Words are chosen to communicate effectively.

Low — There are many faulty word choices and the reader is put in the position of guessing what the writer means.

C. Verb Usuage.

High — The writer has used active rather than passive verb tense and strong verbs.

Low — Verb usuage is often inappropriate.

IV. ORGANIZATION

A. Thesis Statement

High — Thesis statement is clear and well defined.

Low — There is no discernable thesis statement.

B. Topic Sentences.

High — Topic sentences contain a limited topic and a specific impression that can be elaborated in the paragraph.

Low — Topic sentences are either nonexistent or the paragraph that follows has no relationship to what should be the topic sentence.

C.Paragraph Development

High — Paragraphs follow a logical sequence and are all related to the thesis statement. Transitions are smooth.

Low — Paragraphs do not seem to follow any logical order. Transitions are virtually nonexistent.

D. Paragraph Unity.

High — The writer has supported the topic sentence with good detail and examples. There is a logical relationship between the topic sentence and the rest of the paragraph.

Low — Sentences are only loosely related.

E. Concluding Paragraph

High — The concluding paragraph ties all the important points of the essay together and draws a final conclusion.

Low — There is no concluding paragraph apparent.

Student Name_____ Student Number_____

EVALUATION GUIDELINES

Conventions	Low			High
Noun/verb agreement	1	2	3	4
Correct word usage	1	2	3	4
Spelling	1	2	3	4
Proper pronoun reference	1	2	3	4
Punctuation	1	2	3	4
Capitalization	1	2	3	4

Total___÷ 6 = ____

Syntactic Maturity

Sentence Structure	1	2	3	4
Clarity	1	2	3	4

Total____

Style

Point of view.	1	2	3	4
Word appropriateness.	1	2	3	4
Verb usage.	1	2	3	4

Total____

Organization

Thesis statement.	1	2	3	4
Topic sentences.	1	2	3	4
Paragraph development.	1	2	3	4
Paragraph unity.	1	2	3	4
Concluding paragraph.	1	2	3	4

Total_____

Average T-unit Length

Number of words divided by T-units. e.g. I was riding my bike/ and I saw Sherry/and she was playing with her brother.(3 T-units) T-unit is minimal unit that can be punctuated as sentence.

____÷___=___

Sentence Fragments	_____
Simple sentences	_____
Simple sentences with modifers	_____
Compound sentences	_____
Compound sentences with modifers	_____
Complex sentences	_____

COMPUTER USE LOG

COMPUTER: _____

NAME	DATE	TIME IN	TIME OUT	PROGRAM	TASK/CLASS	PERIPHERALS

TECHNOLOGICAL INTERVENTIONS

INPUT

Intervention	Equipment	Disability	Sensory or Motor Skill Transference	Description
Optical Text Scanning	IBM PC, Omni Reader	PI, HI	Physically manipulated print to screen output	Used to overcome limitations on manipulating printed material.
Optical Text Scanning Enlarged Screen	IBM PC, Omni Reader, VTEK Monitor	VI	Visual standard print to visual enlarged print	Used to access printed material that are too small to be seen.
Optical Text Scanning Voice Synthesis	IBM PC, Omni Reader, VOTRAX or DECTALK	VI, LD	Visual print to spoken text	Used to access printed material that can not be seen or read.
Optical Text Scanning Braille Print	IBM PC, Omni Reader, Braille Printer	VI	Visual print to touch print	Used to access printed material that can not be seen.
Transcription	IBM PC or Apple IIe	HI	Spoken text to visual print	Used to access spoken material that can not be heard.
Transcription Voice Synthesis	IBM PC, VOTRAX or DECTALK	VI, LD	Visual print to spoken text	Used to access printed material that can not be seen or read.

OUTPUT

Word Processing	IBM PC, Apple IIe	All	Written script to keyboard entry	Used to allow production of written text.
Word Processing Proofing	IBM PC or Apple IIe, Proofing Software	PI, LD, HI	Written script to keyboard entry	Used to compensate for problems in writing mechanics.
Voice Communication System	IBM Convertible, VOTRAX	SI	Speaking to keyboard entry with voice output	Used to allow vocal communication.
Portable Notewriting System	IBM Convertible or TRS 80 Model 100	PI, LD, VI	Written script to keyboard entry	Used to allow production of written in class notes.
Portable Writing System	IBM Convertible, Printer	PI, LD, VI	Written script to keyboard entry	Used to allow in class writing.
Computer Assisted Design (CAD)	IBM PC, Mouse	PI	Physical drawing to keyboard or mouse entry	Used to allow drawing, drafting, etc.

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SKILL TRAINING/PROCESSING INTERVENTIONS

Intervention	Software/Training Materials	Description	Purpose
Typing Instruction	Typing Tutor	Training in keyboard skills.	Allow data entry on computer.
Writing Mechanics Instruction	Pro Sentence Pro Grammar	Training in writing component skills.	Improve readability of written work.
Writing Organization Instruction	Cognitive Skills	Training in writing content organization.	Improve organization and content of written work.
Writing Organization Instruction	Proteus HBJ Writer	Writing content organization practice.	Allow refinement of writing organizational skills.
Study Skills	Study Skills Program	Training in library skills and paper writing.	Improve use of library and paper writing techniques.
General Knowledge Instruction	Knowledge Master Program	Training in vocabulary and general knowledge.	Enhance background knowledge and vocabulary in basic subject fields.
Language Comprehension Instruction	Cognitive Skills	Training in reading and verbal comprehension.	Improve reading and lecture comprehension and memory for class material.

ADAPTIVE INTERVENTIONS

Intervention	Device/Peripheral	Computer	Description	Purpose
Single Switch Input	Adaptive Firmware Card	Apple	Single switch input using alphabet scanning array.	Allow data entry to computer when keyboard entry not possible.
Single Switch Input	Words+ System	IBM	Single switch input using word scanning array.	Allow data entry to computer when keyboard entry not possible.
Alternative Keyboard	Unicorn Board	Apple	Word or alphabet entry using special function board.	Allow data entry to computer when keyboard entry not possible.
Morse Code Input	Words+ System	IBM	Sip/puff entry using Morse code system.	Allow data entry to computer when keyboard entry not possible.
Voice Output	VOTRAX or DECTALK Speech Synthesizers	IBM	Speech output of computer screen contents and typed commands.	Allow access to computer and screen output when reading screen not possible.
Enlarged Screen	VTEK Monitor	IBM	Screen contents displayed in large typeface.	Allow access to screen output when viewing normal screen not possible.
Braille Print	Braille Printer	IBM or Apple	Program and screen contents printed in braille.	Allow access to screen and program output when viewing screen not possible.
Guarded Keyboard	Keyguard	IBM	Keyguard placed over standard keyboard.	Eliminate drag across keys and allow locking of special purpose keys.
Altered Keyboard	ProKey Program	IBM	Keys reprogramed to enter commands or character strings.	Allow single keystroke entry of commands or special functions.
Abbreviated Input	ProKey Program or Productivity Plus Program	IBM	Macro's written to enter phrases with reduced keystrokes.	Allow entry of phrases or words with fewer keystrokes.
Supported Keyboard	Supports for arm/wrist	IBM or Apple	Supporting devices attached to keyboard.	Provide relief from fatigue in accessing keyboard and/or stabilize arm for control of keystrokes.

INITIAL POPULATION PROFILE

OCTOBER 1985

DISABLING CONDITION	UNL	PROJECT
Total Disabled Students	55	25
Visually Impaired	10	5
Acoustically Impaired	7	2
Brain Trauma	2	1
Learning Disabled	5*	3
Quadriplegic	11	8
Cerebal Palsy	5	3
Muscular Dystrophy	1	-
Muscular Atrophy	1	-
Multiple Sclerosis	1	-
Arthritis	1	1
Spinal Bifida	1	-
Other	10	2

* This number does not represent all Learning Disabled Students at UNL.

Summary of Handicap Survey Pretest

Test #1 N of students = 26 Age: Range 18 - 42 $\bar{X}$ = 24.84 Sex: Male - 18 Female - 8

Handicapping Condition:

Quadriplegic - 8
Cerebral Palsy - 2
Sight Impaired - 4
Hearing Impaired - 2
Dyslexia - 4
Other - 5
Not Coded - 1

1. Before this program, had you had any past experience with computers?

	N	%
Yes =	15	60%
No =	10	40%

1a. If yes (N=15), do you own or have access to a computer?

	N	%
Yes =	12	80%
No =	3	20%

1b. If yes (N=15), how often do you use the computer for coursework?

	N	%
Never =	6	46%
Seldom =	4	31%
Sometimes =	2	15%
Frequently =	1	8%

1c. If yes (N=15), have you ever taken a computer course?

	N	%
Yes =	10	67%
No =	5	33%

1d. If yes (N=15), how would you describe your frequency of use?

	N	%
Used just a few times =	10	67%
Used quite a bit =	5	33%

2. To what extent do you feel intimidated by computers?

	N	%
Not at all =	18	69%
A bit =	6	23%
A fair amount =	2	8%
A lot =	0	0%

3. What type of course do you do best in?

	N	%
English Composition =	4	15%
Foreign Languages =	0	0%
Humanities =	3	11%
Physical Sciences =	1	4%
Life Sciences =	3	12%
Social Sciences =	8	31%
Business =	2	8%
Arts =	5	19%

4. What type of course do you do worst in?

	N	%
English Composition =	3	11%
Foreign Languages =	2	8%
Humanities =	1	4%
Physical Sciences =	10	39%
Life Sciences =	3	11%
Social Sciences =	1	4%
Business =	0	0%
Arts =	6	23%

5. When attending school, how many hours per week do you usually spend on school work?

$\bar{X}$ = 22.46 hours per week
Range = 5 hours to 60 hours
Standard Deviation = 14.4

6. Approximately how many papers have you written for courses at the University?

$\bar{X}$ = 12.7 papers
Range = 0 papers to 50 papers (some of which were a type of daily log)
Standard Deviation = 13.1

7. Approximately how many essay tests have you taken?

$\bar{X}$ = 9.8
Range = 0 to 50
Standard Deviation = 12.7

* Note that five students or approximately 20% of the sample had never taken an essay test.

7a. If you have taken essay tests (N=21), what procedures were used?

	N	%
Hand write self =	4	15%
No answer =	17	85%

8. When you are attending school, how many hours per week do you spend on written work?

$\bar{X}$ = 8.34
Range = 0 hours per week to 20
Standard Deviation = 5.2 hours

9. When you <u>have trouble in a course</u>, how frequently is it due to each of the following factors?

	1. Never	Rarely	Sometimes	Freq.	5. Always
I have not tried hard enough	N=7	N=8	N=8	N=3	N=0
$\bar{X}$ = 2.26	27%	31%	31%	11%	0%
I do not have natural ability in this area	N=2	N=9	N=8	N=5	N=2
$\bar{X}$ = 2.84	8%	35%	31%	19%	7%
My handicap interferes	N=0	N=3	N=11	N=10	N=2
$\bar{X}$ = 3.42	0%	11%	42%	39%	8%
My teacher does not understand my learning needs	N=3	N=9	N=12	N=2	N=0
	11%	35%	46%	8%	0%
$\bar{X}$ = 2.50					
My teacher does not understand my physical limitations	N=8	N=8	N=7	N=3	N=0
	31%	31%	27%	11%	0%
$\bar{X}$ = 2.53					

10. When you <u>are successful in a course</u>, how frequently is it due to the following factors?

	1. Never	Rarely	Sometimes	Freq.	5. Always
I worked very hard	N=0	N=0	N=5	N=11	N=15
$\bar{X}$ = 4.19	0%	0%	19%	42%	19%
I have natural ability in this area	N=2	N=0	N=10	N=12	N=2
$\bar{X}$ = 3.46	8%	0%	38%	46%	8%
My handicap did not interfere	N=2	N=5	N=10	N=9	N=0
$\bar{X}$ = 3.00	8%	19%	38%	35%	0%
My teacher understands my learning needs	N=0	N=3	N=9	N=8	N=6
	0%	11%	35%	31%	23%
$\bar{X}$ = 3.65					
My teacher understands my physical limitations	N=2	N=3	N=5	N=9	N=7
	7%	11%	19%	36%	27%
$\bar{X}$ = 3.61					

11. There are many ways to spend time studying for a course. Please distribute your study time over the following categories.

	Average Percentage
Reading required material	37%
Writing and preparing papers for class	18%
Working in other written homework	15%
Studying for tests	23%
Other	7%

12. What do you expect your GPA to be next semester?

$\bar{X}$ = 2.81
Range = 2.00 to 4.00
Standard Deviation = .54

13. Approximately 50% of the people who start college actually graduate. What do you think are the chances that you will complete college?

$\bar{X}$ = 83.61%
Range = 50% to 99%
Standard Deviation = 17.15

14. Using a scale from 1 = not at all confident to 5 = very confident, how confident are you of your ability in each of the following types of courses.

	$\bar{X}$	Range	Standard Deviation
English Composition	3.57	1 to 5	1.10
Foreign Languages	2.19	1 to 5	1.35
Humanities	3.42	1 to 5	.94
Physical Sciences	2.26	1 to 5	1.28
Life Sciences	2.84	1 to 5	1.12
Social Sciences	3.65	1 to 5	1.16
Business	3.19	1 to 5	1.26
Arts	3.04	1 to 5	1.42
Classes with essay tests	3.19	1 to 5	1.32
Classes with multiple choice tests	3.46	1 to 5	1.14
Classes with labs	3.20	1 to 5	1.80

15. In what way do you think the computers connected to this program will be useful to you?

	N
Paper writing	21
Learn how to type	2
Proof read papers	1
Bookkeeping	1
Learn about computers	7
Essay tests	4
Learn another skill	1
Math skills	2
Programming historical events	1

Help with financial independence	1
Don't know - No idea	3
Speech synthesizer	1

* Note that some students gave more than one response so the N does not add up to 26.

16. When you set goals for yourself do you typically:

	N	%
Set them about right	12	46%
Set them too low, reach them easily and wish you had set them higher	2	2%
Set them too high, fail to reach them and get discouraged	12	46%

17. What problems do you have at the University because of your handicap?

Academically	N
Can communicate knowledge verbally but can't demonstrate it on tests	1
Difficult to write, note take	4
Pain interferes with studying	1
Need a tutor	1
Trouble reading - teacher can't understand I need to <u>see</u> material to learn it	1
Lack of time - difficulties with writing	2
Slow reader and test taker	1
Takes longer to do work	4
Taking notes off board - comprehension of material - teachers go too fast - don't understand my problems - <u>present</u> material rather than teaching it	1
Being behind and trouble reading	2
Courses too hard	1
Hard to find readers	1
None	5
Overhead and blackboard hard	1
Communication lacking until I initiate it	1
Writing a lot and library research	1
Have to rely on note takers for large classes (e.g., Art History) especially if in the dark	1
Difficulty setting goals	1

18. What problems do you have at the University because of your handicap?

Socially	N
None	15
Older than most	1
Dyslexia slows down	1
Some activity buildings inaccessible	1
So much time spent on studying have little time for anything else	2
Sometimes don't hear what is going on around me	1
Activities not geared for disabled persons	1

People appear friendly but difficult to develop close relationships	1
People being awkward	1
Transportation difficulties when dating	1
Getting others to understand dyslexia - may treat others like an invalid	1
Restricted due to immobility - need to be carried up stairs	1
Problems with integration with non-handicapped people	1
Shy with others	1

19. What problems do you have at the University because of your handicap?

Practical Matters like Getting Around	N
None	14
Pain - steps are tiring	1
Winter is hard	2
Most problems in this area	1
Takes longer especially in snow and ice	2
Getting into buildings	3
Personal care takes a long time	1
No elevators off campus or ramps	1
Transportation	1
Can't be out in the cold (circulation problems)	1

20. What do you see yourself doing after graduation?

	N
Don't know	2
Work with people	1
Go on year trip to France	1
Library work or office management	1
Management	1
Working to be best in profession (whatever it is) and develop new opportunities	1
Teaching job	1
Social work	1
More school	1
Aerospace programs	1
Admission counseling	1
Working in a Vet Hospital	1
Grad school and Ph.D. in psychology	1
Coaching and teaching	1
Rehab counselor	1
Parent educator - specialist in elementary teaching	1
Work in radio and TV and sports production	1
Working - helping handicapped - counseling	1
Work at a radio station - eventually programmer at station	1
Start own business	1
Making money - a living - making it on own	1
Sales and service - hopefully owning own business	1
Journalism - advertising firm - masters degree	1
Christian counseling or experimental psychology	1
Advertising or teaching art	1
Taking a world tour - coaching - not in Midwest	1
Counseling/teaching	1

21. Before this interview approximately how many hours per week have you spent with the equipment in this program?

	N
0	17
1	2
4	1
5	1
6-7	1
10-12	1
15-20	1
24	1
30	1

22. List some occupations you think you could do well.

Music composition	1	Working in Vet Hospital	1
Teaching	5	High school guidance counselor	1
Writer	1	Psychologist	2
Public relations	1	Art related field	3
Sociology	1	Coaching	1
Psychology (one on one)	1	Rehabilitation counseling	2
Almost any	1	Group home parent	1
Act on stage	1	Parent education specialist	1
History	1	Volunteer services coordinator	1
Political science	1	Resource development specialist	1
Journalism	1	Broadcasting	1
Singing	1	Film production	1
Counseling	4	Computer programmer	2
Probation officer	1	Engineer	1
Business	2	Automotive engineering	1
Natural sciences	1	Management	3
Interior design	1	News editor	1
Early childhood education	1	Radio job	1
Social work	3	Large animal veterinarian	1
Physical therapist	1	Doctor	1
Special education	1	Be own boss	1
Secretarial work	1	Sales	1
People related work	3	Farming	1
Developing human resources	1	Advertising	2
Admission counseling	1	Theology	1
Piece work (factory)	1	Teaching adult wellness	1
Drug and alcohol rehab	1	Working with elderly	1
Travel	1	Stock broker	1
Financial planner	1		

STUDENT UTILIZATION OF THE CENTER

JANUARY 1986

DISABILITY	APPLICATIONS	USAGE		
		COMPUTER	ACADEMIC	BOTH
Quadriplegic	8	2	2	4
Orthopedic	5	1	-	2
Visually Impaired	7	3	2	1
Learning Disabled	6	3	-	4
Hearing Impaired	4	-	2	1
Head Trauma	2	1	-	1
Cerebal Palsy	3	1	-	2
Arthritis	1	-	-	1
TOTAL	36	16	6	11

STUDENT UTILIZATION OF THE CENTER

JUNE 1986

DISABILITY	APPLICATIONS	USAGE		
		COMPUTER	ACADEMIC	BOTH
Quadriplegic	9	2	3	4
Orthopedic	6	2	-	2
Visually Impaired	8	3	3	1
Learning Disabled	10	3	-	7
Hearing Impaired	5	1	2	1
Head Trauma	2	1	-	1
Cerebral Palsy	4	1	-	3
Arthritis	1	-	-	1
Multiple Sclerosis	1	-	-	1
Multiply Handicapped	1	-	1	-
TOTAL	47	13	9	21

SUMMARY OF STUDENT TECHNOLOGICAL AND EDUCATIONAL NEEDS

Intervention	Number of Students
Technological Interventions	
Input	
Optical Text Scanning	2
Optical Text Scanning/Enlarged Screen	5
Optical Text Scanning/Voice Synthesis	8
Optical Text Scanning/Braille Print	1
Transcription	1
Transcription/Voice Synthesis	0
Output	
Word Processing	5
Word Processing/Proofing	8
Voice Communication System	1
Portable Notewriting System	15
Portable Writing System	1
Computer Assisted Design (CAD)	1
Skill Training/Processing Interventions	
Typing Instruction	8
Writing Mechanics Instruction	6
Writing Organization Instruction	11
Study Skills	8
General Knowledge Instruction	8
Language Comprehension Instruction	7
Adaptive Interventions	
Single Switch Input/Adaptive Firmware Card	0
Single Switch Input/Words+ System	2
Alternative Keyboard	0
Morse Code Input	0
Voice Output	3
Enlarged Screen	4
Braille Print	1
Guarded Keyboard	2
Altered Keyboard	3
Abbreviated Input	10
Supported Keyboard	2

BIBLIOGRAPHY OF SOURCES FOR INFORMATION ON TECHNOLOGICAL ADAPTATIONS FOR THE DISABLED

Publications

Closing The Gap: Computer Technology for Special Education and Rehabilitation, (Bi-Monthly Magazine). Dolores Hagen, Box 68, Henderson, MN 56044

Computer Technology for the Handicapped: Proceedings of the Closing The Gap Conference, (Annual: 84, 85, 86). Michael Gergen (and others), Closing The Gap, Box 68, Henderson, MN 56044.

International Software/Hardware Registry, 2nd Edition (1984). Gregg Vanderheiden, Dale Bengston, Mary Brady, Lottie Walstead (Eds.), Trace Research and Development Center on Communication, Control, and Computer Access for Handicapped Individuals, University of Wisconsin-Madison, 314 Waisman Center, 1500 Highland Avenue, Madison, Wisconsin 53706.

Microcomputer Resource Book for Special Education (1984). Dolores Hagen, Closing The Gap, Box 68, Henderson MN 56044.

Personal Computers and the Disabled (1984). Peter McWilliams, Closing The Gap, Box 68, Henderson MN 56044.

The Book of Apple Software, 6th Edition (1985). Jeffrey Stanton, Mia McCroskey & Michael Mellin (Eds.), Arrays, Inc., 6711 Valjean Avenue, Van Nuys, CA 91406.

The Book of IBM Software, 3rd Edition (1986). Mia McCroskey & Michael Mellin (Eds.), Arrays, Inc., 6711 Valjean Avenue, Van Nuys, CA 91406.

General Information Sources

Augmentative Communication Center, 318H Barkley Memorial Center, University of Nebraska-Lincoln, 68588-0739 (David Beukelman).

Center for Special Education Technology, Council for Exceptional Children, 1920 Association Dr., Reston, VA 22091.

Closing The Gap, Box 68, Henderson, MN 56044.

IBM Educational Systems, 411 Northside Parkway, Atlanta, GA 30327 (Walter Dean).

Trace Research and Development Center on Communication, Control, and Computer Access for Handicapped Individuals, University of Wisconsin-Madison, 314 Waisman Center, 1500 Highland Avenue, Madison, Wisconsin 53706.

E.C.D.S. EQUIPMENT INVENTORY

Computers

Quantity	Model	Configuration
3	Apple IIe	128K / Monitor
2	IBM PC	256K / Monitor / 2 Disk Drives
5	IBM PC Portable	256K / Monitor / 2 Disk Drives
1	IBM PC XT	640K / Monitor / 2 Disk Drives / Hard Disk
1	Words+ Living Center	640K / Monitor / 2 Disk Drives / Hard Disk
1	NCR First Step	64K / Monitor / 2 Disk Drives

Lap Top Computers

Quantity	Model	Configuration
5	TRS 80 Model 100	16K / Monitor
1	IBM PC Convertible	256K / Monitor / 1 Disk Drive

Printers

Quantity	Model	Type
4	Panasonic KX-P1091	Dot Matrix
2	Apple Imagewriter	Dot Matrix
1	Epson LX-86	Dot Matrix
1	Epson FX-85	Dot Matrix
1	IBM Graphics Printer	Dot Matrix
1	NCR First Step	Daisy Wheel
1	IBM PC Convertible Printer	Dot Matrix

Miscellaneous

Quantity	Model
1	Hayes Smartmodem 300
1	Amdec Monitor
1	Gold Star Monitor
3	Apple Disk Drives
1	Cannon 5 Star Typewriter

Adaptive Equipment

Quantity	Model
1	VTEK Large Print Display Monitor
2	VOTRAX Person Speech System Voice Synthesizer
1	DECTALK Voice Synthesizer
2	Omni-Reader Optical Character Reader
1	Mouse Systems Mouse Input Device
2	Adaptive Firmware Card
2	Unicorn Board

E.C.D.S. SOFTWARE INVENTORY

General Purpose Software

Program Name	Computer	Description
PFS Write	IBM	Word Processor / Proofreader
PFS Write	Apple	Word Processor
Word Perfect	IBM	Word Processor / Proofreader
Magic Slate	Apple	Word Processor
PFS Plan	IBM	Spreadsheet
PFS Plan	Apple	Spreadsheet
PFS File	IBM	Data Base
PFS Report	IBM	Data File Report Writer
PFS Graph	IBM	Graph Writing
PFS Graph	Apple	Graph Writing
Lotus Symphony	IBM	Integrated Spreadsheet / Word Processing / Data File
Apple Works	Apple	Integrated Word Processing / Data File
Sensible Speller	Apple	Spelling Checker
Newsroom	IBM/Apple	Clip Art/ Word Processing
Crosstalk	IBM	Communications / Modem Operation
Remote Control	IBM	Communications / Modem Operation
	TRS 80	Data Transfer

Educational Software

Program Name	Computer	Description
Typing Tutor III	IBM	Typing Instruction
Knowledge Master	Apple	General Knowledge Instruction
Study Skills	Apple	Research / Paper Writing Instruction
Pro Sentence	Apple	Instruction in sentence writing
Pro Grammar	Apple	Grammar Usage Instruction
EZ Pilot II	IBM	Educational Course / Test Authoring Program
MPALS	IBM	Authoring / Educational Course Development Program

Special Purpose Software

Program Name	Computer	Description
Proteus	IBM/Apple	Writing Organization / Outlining
Rightwriter	IBM	Grammar / Style Diagnostics
HBJ Writer	IBM	Writing Organization / Word Processing / Style Diagnostics
AI Typist	IBM	Word Processing / Real Time Spell Checking
PC Paint	IBM	Drawing Program
AutoCad	IBM	CAD/CAM Drawing / Drafting Program

Adaptive Software

Program Name	Computer	Description
Prokey	IBM	Keyboard Alteration / Macro Writing
Productivity Plus	IBM	Abbreviated Keyboard Input / Macro Writing
Screen Talk	IBM	Screen Voice Output
Words + Living Center	IBM	Alternate Keyboard Input / Voice Output
Mouse Systems	IBM	Alternate (Mouse) Input